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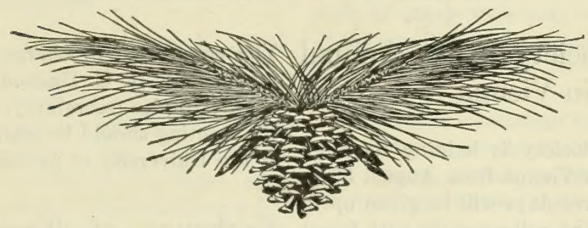
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FOREST WORKER



May, 1931

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UNITED STATES DEPARTMENT OF AGRICULTURE

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Announcements

German Forestry Society Holds Annual Meeting in Vienna

The German Forestry Society is holding its large annual meeting this year in Vienna from August 30 to September 7. The first three days will be given up to forestry papers. The meeting will conclude with forest excursions to the silviculturally important districts of Austria and Bavaria. Forestry machines and tools for wood cutting, transportation, soil cultivation, and insect control will be exhibited on September 2. As is the case every year, writes Forstmeister J. A. von Monroy, it will be a pleasure to the German Forestry Society to be able to welcome foreign guests. Further information may be obtained through the foreign committee of the German Forestry Society, Berlin SW 11, Dessauerstrasse 26/III.

Range Research Conference

The Ecological Society of America is sponsoring a meeting for discussion of range research with particular attention to methods. The dates chosen are August 17-20, 1931, and the meeting place is the Great Basin Branch Station of the Intermountain Forest and Range Experiment Station, at Ephraim, Utah. Opportunity will be given for field discussions and demonstrations.

The committee in charge consists of C. L. Forsling (chairman), H. C. Hanson, Walter P. Taylor, and W. G. McGinnies (secretary). Any inquiries in regard to the meeting should be addressed to Doctor McGinnies at the University of Arizona, Tucson, Ariz.

Exchange of Tree Seed Desired by Philippine Forestry Bureau

The Philippine Bureau of Forestry is interested in obtaining seed of all tropical and subtropical conifers, casuarinas, cycas, palms, etc., for planting in the Makiling National Botanic Garden at Los Baños, Laguna, P. I. Arthur F. Fischer, director of the bureau, in a communication to the Chief of the United States Bureau of Plant Industry, lists 100 species of trees of which he will be glad to send seed to the United States in exchange for seed of trees desired for introduction into the Philippines. Among the latter he lists *Chamaecyparis lawsoniana*, *Cupressus arizonica*, *Cupressus sempervirens*, *Juniperus communis*, *Juniperus virginiana*, *Thuja occidentalis*, *Libocedrus decurrens*, *Picea orientalis*, *Pinus caribaea*, *Pinus edulis*, *Pinus ponderosa*, and other conifers typical of the southern United States and of Mexico. It is suggested that persons interested in exchanging seed with Director Fischer correspond directly with him at Manila, P. I.

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Because the free edition is necessarily limited, this periodical can be distributed without charge outside of the Government service only to such persons and organizations as State forestry and conservation officials, State agricultural extension directors, faculties and libraries of forest schools, and forestry associations. Others desiring to obtain copies of the **FOREST WORKER** can do so by sending 5 cents for a single copy or 25 cents for a year's subscription to the Superintendent of Documents, Government Printing Office, Washington, D. C. Foreign subscriptions: Yearly, 35 cents; single copies, 7 cents.

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State Forestry

Reforestation Law Approved in Washington

Following approval at last fall's election of an amendment to the Washington State Constitution authorizing enactment of special forest tax legislation, a reforestation measure has passed the legislature and been approved by the governor. The new law provides that cut-over lands classified by the State forest board as reforestation lands shall be assessed at a flat rate of \$1 per acre if west of the Cascades and 50 cents per acre if east of the Cascades, and that timber produced on such lands shall be subject to a yield tax of 12½ per cent when harvested.

Utah Land Board Given Broad Authority for Flood-Control Measures

The State Land Board of Utah has recently been given authority to take measures calculated to go a long way toward preventing and controlling floods. The legislation conferring this authority also directs reorganization of the board, replacing its ex officio membership with an executive secretary and two per diem associate members.

The amended law defining the board's functions empowers it to make surveys of areas in Utah where floods have occurred or are likely to occur and directs it to "take immediate action such as it may deem necessary to control and/or to prevent the occurrence of such floods." Authority is given for employing experts to make flood surveys. The flood-control measures authorized include engineering works, acquisition of lands needed for flood prevention by purchase, exchange, lease, gift, or condemnation, and regulation of grazing lands. The board is given the duty of cooperating with the sheriffs of the various counties in extinguishing and preventing fires on watershed lands and is authorized to employ men to patrol watershed lands. It is authorized also to cooperate with the Federal Government in acquiring lands on watersheds that are approaching a barren condition as a result of overgrazing and "to take such steps and actions as it may deem necessary and sufficient to prevent said lands from becoming barren so as to cause floods, and

to promote revegetation of the said lands." The board "may in its discretion limit the number and kind of stock that may be grazed each year on any State land leased for grazing purposes and may stipulate the number of days that such land may be grazed."

The recent enactment also authorizes the appropriation of funds for flood-control works and for the purchase, lease, patrol, revegetation, and survey of lands for flood prevention and control.

State Forest and State Park Purchase Program Suggested in New Jersey

Nearly 2,000,000 acres of New Jersey's total area of a little more than 5,263,000 acres is wild land, and the acreage of wild land in the State is increasing, the State board of conservation and development points out in recommending to the legislature a 10-year program for acquisition of State parks and State forests. About 1,500,000 acres of the wild land is unproductive at the present time. To rehabilitate this waste land would not involve the difficult problems of irrigation, flood control, or drainage involved in reclamation projects in other parts of the country. "If given proper care and help it can all be made useful, profitable, and beautiful within 50 years and much of it within 25 to 30 years."

State forests and State parks now established in New Jersey aggregate 45,996 acres only. The State has but 10 acres of organized public reservations per 1,000 inhabitants. This figure is compared by the board with figures for New York, Minnesota, Wisconsin, Pennsylvania, Michigan, Vermont, New Hampshire, and Massachusetts, States having from two to twenty times as great forest and park areas in proportion to population as New Jersey. In New York, Minnesota, and Wisconsin State-owned lands of this character total 207 acres, 183 acres, and 170 acres, respectively, per 1,000 inhabitants.

The board recommends an increase of State forest and State park area by 69,245 acres in north Jersey and 273,777 acres in south Jersey, and the creation of five seashore parks totaling 765 acres. With the additions outlined the State would have 17 parks and 10 forests. The prospective cost of the 343,787 acres the purchase

of which is recommended is estimated at \$7,593,500. For the coming fiscal year the board requests an appropriation of \$730,000 to make possible the beginning of the purchases suggested.

Maryland Purchases 6,000-Acre State Forest

A new State forest of 6,000 acres has been acquired by Maryland in Garrett County, by purchase from the Manor Mining and Manufacturing Co. The tract extends from Wallman to Schell on the Potomac River and up the slopes of Backbone Mountain. Mike Tasker, a forest warden of more than 15 years' experience, has been placed in charge as resident warden.

Other State forests in Garrett County are one of 17,000 acres in the Savage River section and one of about 4,000 acres in the Swallow Falls area. With smaller units in six other counties, Maryland's present total State forest area approximates 33,000 acres. Small tracts under option for purchase as State forests aggregate about 7,000 acres.

High Rock Tract Given to Connecticut as State Forest

The family of the late Harris Whittemore have presented the High Rock tract to the State of Connecticut, for park and forest purposes. This is an area of approximately 2,000 acres of hill country on both sides of the Naugatuck River, near Beacon Falls. A pleasure park was formerly maintained at this point by the New York, New Haven & Hartford Railroad Co., and trails which were made at that time leading to the summit of the cliff known as High Rock are still usable. Mr. Whittemore, who served for many years as a member of the Connecticut Park and Forest Commission, began acquiring this area soon after the war with the intention of presenting it to the State. The State park and forest commission has designated it for the present as the High Rock State Forest and intends when appropriations permit to develop portions of it as a park.

A lookout tower is maintained by the State on the hill east of the river, and 30 miles of firebreaks were cleaned out last winter. Several hundred acres of pine and spruce plantations established on the area shortly after a destructive fire in 1922 have prospered and are about to obliterate the signs of the fire.

New York State funds to the amount of \$42,682.93 were recently granted to 20 counties as aid in reforestation, under the law of 1929 that authorizes the State to match county appropriations for reforestation purposes to a maximum of \$5,000 per county per year. The 20 counties certified that they appropriated \$59,178 for reforestation purposes during 1930.

New Hampshire Society Announces Series of Public Forest Acquisitions

Title to the Binney Pond property in New Ipswich, N. H., now rests in the State, announces the Society for Protection of New Hampshire Forests, which was active in soliciting contributions toward the purchase price of \$3,000. This 90-acre property is located on the Wapack Trail, which extends 20 miles northward from Mount Watatic, immediately south of the Massachusetts-New Hampshire boundary. Old-growth pines and hemlocks intermixed with spruces cover about half its area. The property becomes a wild-life refuge, and the Appalachian Mountain Club has the privilege of establishing a camp on the shore of Binney Pond, which is the only body of water along the Wapack Trail.

Several new forest reservations along New Hampshire highways are announced by the society, bringing the total of such reservations in the State close to 100. Three miles of roadside woodlands have been given to Keene, N. H., and neighboring towns by F. L. Carey in the last days of his term as mayor of Keene. These woodlands, located for the most part upon the Dartmouth College and Franklin Pierce highways, are never less than 100 feet in depth and in some places widen to 300 feet. At Mayor Carey's invitation Jules G. Levy, of New York City, is giving a tract one-fourth mile long on the Franklin Pierce highway. On the Dartmouth College highway 4 miles north of Keene, in Gilsum, roadside areas are being transferred to town ownership by Walter R. Kirk and Harry A. Pierce. A tract wooded with hardwoods interspersed with pines and hemlocks bordering the Dartmouth College highway between Hanover and Lebanon has been given to the town of Hanover by Prof. and Mrs. Charles N. Haskins, of Hanover.

A movement for planting trees along highways and in school yards has been promoted this spring by the Society for Protection of New Hampshire Forests as a feature of the observance of the George Washington Bicentennial. For this purpose the society's committee on tree planting, headed by Karl W. Woodward, offered to distribute 200,000 5-year-old northern white pines provided by the State forestry department. The trees were to be loaded into trucks at the State forest nursery, near Concord, and delivered without charge at locations specified by those who had undertaken to plant them.

Private tree planters in Berks County, Pa., received 500,000 forest trees from the State nursery supply this spring. In addition the Reading Water Bureau purchased about 600,000 trees from other sources for planting on the Maiden Creek watershed. Trees planted in the county prior to 1931 as shown by State records totaled 5,000,000.

Fall Preferred as Season for Transplanting Conifers at Pennsylvania Nursery

For several years the practice followed in transplanting tree seedlings at the Rockview Nursery, operated in connection with the New Western Penitentiary of Pennsylvania, has been to do most of this work in the fall. About 500,000 seedlings are transplanted each year at this nursery, of which Harry G. Eby has charge as forester of the State department of welfare. A 2-1 fall transplant is found to be better developed than a spring transplant both in roots and in top, and in the fall more time is available for the work.

In order to hasten dormancy, the seedling beds are not irrigated after August 15. Transplanting begins about September 1 and usually continues through the month. The transplant beds are watered on the evening before the planting, and the reset seedlings are watered each evening. In two or three weeks' time the transplanted trees have made new growth, reestablished themselves, and made ready to get a quick start in the spring.

It was in August, 1929, that Mr. Eby began an experiment to find what forest tree species in addition to Norway spruce, white spruce, blue spruce, hemlock, and cedars could be transplanted successfully in the autumn at the Rockview Nursery. He used 16 species, planting 500 trees of each species in a solid block. Of northern white pine and Scotch pine a block each of 2-year and 3-year seedlings was planted. All the seedlings were dug and planted under similar conditions, in warm, dry weather. The operation was completed the same day it was begun. The trees were watered frequently, and all were mulched for winter. In August, 1930, just one year after the planting, a count of the living trees revealed the following results:

Species	Age	Establishment percentage	Species	Age	Establishment percentage
Norway spruce.....	2	96.5	Hemlock.....	3	72.6
Cedar.....	2	95.8	Western yellow pine..	2	64.3
Northern white pine..	2	94.0	Austrian pine.....	2	55.4
Japanese red pine....	3	91.4	Pitch pine.....	3	42.5
Douglas fir.....	3	85.1	Corsican pine.....	2	40.9
White spruce.....	2	84.3	Jack pine.....	2	40.8
Shortleaf pine.....	2	78.5	Scotch pine.....	3	35.5
Scotch pine.....	2	73.3	Norway pine.....	3	32.8
Northern white pine..	3	72.9	Mountain pine.....	2	16.9

In this experiment the hard pines as a class suffered the most severely.

If possible, fall planting should, of course, be done at a time when the soil is moist, Mr. Eby remarks, and it should not be delayed until the soil becomes too cold to permit some root growth before winter sets in. The only extra expense involved in fall transplanting, he finds, is that of mulching. It is necessary to mulch rather heavily to prevent the young trees from being

heaved out in the spring. At the Rockview Nursery pine needles, straw, and hardwood leaves have been tested as mulch. The pine needles have been found the most desirable material, because they will not blow from the beds and may be used as a permanent mulch through the summer.

Los Angeles County Forest Planting Assumes Experimental Character

Los Angeles County, Calif., continued its forestation program in 1930 with the field planting of 56,861 trees. Planting was done on 10 different areas and with approximately 20 different species. Potted trees made up 60 per cent of the stock used. In reporting this diminished annual planting the county forester, Spence D. Turner, announced a change of policy which substitutes experimental planting for large-scale forestation work. Extensive planting is being continued in a few instances in which special conditions are present.

In addition to planting trees in the numbers quoted the county forestry department distributed 9,962 trees from its nurseries to individuals for planting on major watersheds.

Roadside trees planted by the department in 1930 numbered 13,761.

An inventory of the department's nurseries revealed a total stock of 137,586 seedlings and 95,562 transplants, including 67,624 transplants in pots. During the year the department collected 4,300 pounds of clean seed of various forest tree species.

Two new forest fire fighting trucks equipped with 600-gallon water tanks and 120-gallon-per-minute pumps were purchased during the year by the county, which now owns four trucks of this class.

Plans of the Vermont Forest Service for the spring of 1931 called for the planting of 100,000 Norway spruce on the Calvin Coolidge State Forest, Plymouth, and for smaller plantings on several other State forests.

The establishment of a municipal forest by the city of Rome, Ga., was provided for by the late Frances Andrews, botanist, who bequeathed for this purpose royalties from books published by her.

To get first-hand evidence against the razorback hog as a destroyer of longleaf pines P. N. Howell, one of Mississippi's State forest commissioners, followed a hog for 8½ hours, from 8 a. m. till 4.15 p. m. In that time the hog rooted out 400 trees. At that rate, Mr. Howell calculated, in 100 days the hog would destroy trees the growing and planting of which would cost \$200, or more than forty times its own value.

Tennessee Law Puts Penalties on Carelessness with Fire

Under an act of the Tennessee Legislature approved March 20, 1931, it is unlawful for anyone originating or using an open-air fire to leave the fire unextinguished if it is within 150 feet of forest or woodland or of inflammable material from which fire would be likely to spread to forest or woodland. The penalty established is a fine of from \$5 to \$50, together with costs. In addition, a violator of the law is made liable for damages, including all costs incurred in efforts to extinguish the fire.

Hawaiian Planting Project Succeeds on Eroded Land Prepared with Dynamite

At Fort Shafter, Hawaii, swamp oak and silk oak are showing unexpectedly good survival and growth on eroded land which enlisted men prepared for the planting by means of dynamite. The scar on which the planting was done is the largest on the Kahauiki ridge, having an area of more than 28 acres. In blasting holes for the tree planting one-third to one-half stick of dynamite was used for each hole. Ten men were able to make from 250 to 300 holes a day. The dynamiting was begun on November 12, 1929. The planting, which was carried out by the territorial forestry division, was begun in December, 1929, and continued through April, 1930. In that time 17,533 trees were planted on a little more than 21 acres. On January 9, 1931, Territorial Forester C. S. Judd and an assistant made a count of 524 of the trees on the most exposed section of the scar. Of this number only 51 were blanks. Of the survivors 96 were 1 foot high, 243 were 2 feet high, 117 were 3 feet high, and 17 were 4 feet high. Thus the survival percentage was 90.3 and the average height of the surviving trees was 2.1 feet. Describing results as of January, 1931, Mr. Judd writes:

The soil around the trees in the holes that were dynamited is still well pulverized and soft, after one year since treatment.

The area received gentle showers during the summer of 1930, which favored tree growth, and there were four very heavy downpours, the last coming on November 18, 1930, when Kalihi Valley was flooded, with loss of life. These downpours have washed out a few of the young trees, but more damage has been done by the strong trade winds, which pick up dirt particles and thus have an abrasive effect on the plants. One slide near the top of the largest scar, resulting from an overhanging bank giving way, also wiped out a small section of the trees.

In spite of these destructive agencies and notwithstanding the fact that the trees were planted in hard soil practically devoid of organic matter, remarkable success has been attained, and I feel safe in predicting that within four years the ugly scar will be so well covered by these trees that it will show up green instead of red as at present.

The trees have put out a remarkable root system and show a wonderful tenacity in maintaining themselves

in this sterile soil. One swamp oak 2½ feet high and one year old, in the effort to obtain moisture in loose soil near by, has put out a rootlet 7 feet long.

These results compare very favorably with those obtained on other areas furnishing much better soil.

On the above date of inspection, it was with pleasure that I saw three soldiers from Fort Shafter cultivating the trees that were in need of attention.

Because of the success so unexpectedly attained in this planting it is thought to be well worth while to complete the project.

Florida Commercial Forestry Conference

The first Florida Commercial Forestry Conference, held at Marianna April 17 and 18, had a registered attendance of 140. The program arranged under the auspices of the Florida Chamber of Commerce and the Florida Forestry Association, with assistance from the United States Chamber of Commerce, opened with a half-day session on the topic "Florida's forest wealth," with local conservation officials, a local turpentine operator, and the president of the State federation of women's clubs as speakers.

Florida's forest industries were the subject of the afternoon session. Carl Speh, of the Pine Institute of America, told of improved practices in the turpentine and rosin industry, advocating protection by fire-breaks as less expensive and more profitable than raking and burning. S. O. Shinholser, vice president of the Standard Container Manufacturers, told how improved container manufacture had established markets for fruits and vegetables. Harry Lee Baker, Florida State forester, discussed the plans of the State forest service, which at present are devoted mainly to public relations, applied forestry and research, and fire control. One purpose entertained by the service is to have a highway demonstration forest plantation in every county. One-tenth of the total forest area of the State, or 1,400,000 acres, is now protected from fire, he said. The forest protection system includes 17 steel fire towers. Samples of paper produced from southern woods in experiments carried out by the Forest Products Laboratory were shown and discussed by Senior Chemist P. K. Baird. Mr. Baird expressed the opinion that the 1,200 tons of wood pulp per day now imported into the United States might as well be furnished by the South. This opinion was affirmed also by Charles Herty, industrial chemist, of New York City.

Forest land problems were discussed in the morning session of April 18. C. H. Overman, of the Bagdad Land & Lumber Co., speaking on "Effects of taxation on holding forest property," asserted that no less than 20 per cent, or 5,000,000 acres, of Florida's forest land has been cut over and burned and is now listed as tax delinquent. E. A. Ziegler, senior forest economist, United States Forest Service, said that only 10 per cent of the soil food available for second-growth pine in Florida is being used at the present time.

The conference concluded with a visit to the Southern Kraft Paper Plant at Panama City. This plant is now producing 200 tons of kraft paper a day and has a capacity of 400 tons. Of special interest are the devices for salvaging chemicals and heat. The company owning the plant owns 70,000 acres of land on which it plans to produce pulpwood.

Connecticut and Massachusetts Provide Forestry Work for Unemployed

Acting on a recommendation which Governor Wilbur L. Cross embodied in his inaugural address, the Connecticut Legislature appropriated \$100,000 to provide work on State forests as a measure for unemployment relief. Within a few days after the act was approved, on February 4, work was provided for crews of men on State forests in several different sections of Connecticut. By March 14, 400 men were working in 15 State forests, and 100 men in 10 State parks. These men came from 70 Connecticut cities and towns. Governor Cross estimated on March 14 that at least 3,000 people were receiving substantial relief through this appropriation.

Massachusetts likewise made work on State forests a means of unemployment relief, devoting \$100,000 to the purpose. This money, however, instead of being specially appropriated came out of regular appropriations for the purchase and development of State forests.



Land classified under the Indiana forest taxation law in the 5-month period ending with February of this year totaled 12,917.7 acres. This land is the property of 143 different owners.

Newnan, Ga., Establishes Municipal Forest

Newnan, Ga., is initiating forest management on its 800-acre watershed property. The Georgia Forest Service has made a survey of the property and prepared a plan of management. A 5-year planting operation is planned to reforest 250 acres of open land. The existing stand will be improved by the removal of dead and damaged trees and of inferior species. A portion of the land bordering the La Grange highway has been set aside as a park area.



Conservation Week was observed in New York State April 1-7, in response to a proclamation by Governor Roosevelt. During the week the Empire State Forest Products Association mailed reprints of a Journal of Forestry article by its secretary, A. B. Recknagel, entitled "What the private timberland owners are doing and have done in forestry in the Adirondacks," to 1,412 New York State lumbermen, foresters, fish and game clubs, daily and weekly papers, etc. Inclosed with each copy of the reprint were two 6-inch rulers of Adirondack hard maple bearing a fire warning.



A 10-acre experimental planting of Norway spruce for Christmas-tree production was a part of New York's plans for forestry work this spring. The planting site chosen was a part of a reforestation area recently acquired by the State in Livingston County, north of Canaseraga. The trees were to be planted 3 feet apart each way.

Education and Extension

New York State College of Forestry Admitted to International Research Union

The New York State College of Forestry, Syracuse, N. Y., has been elected to membership in the International Union of Forest Research Organizations. This is the sixth institution in the United States to become a member of the union, those previously admitted to membership being the Harvard Forest, the Yale School of Forestry, the School of Forestry and Conservation of the University of Michigan, the Forest Soil Laboratory of Cornell University, and the Forest School of the University of California.

The International Union of Forest Research Organizations originated in 1929 when the International Union of Forest Experiment Stations adopted a new constitution extending its field to include all forest

research. At the end of 1930 it had 54 ordinary and 3 associate members, in more than twenty nations. The largest membership in any nation was that of Germany, including eight institutions. The British Empire had six members.

Cornell Works Out Effective Method of Exterminating Weed Trees

Sodium arsenite proved practicable as a means of killing the crowns and root systems of aspen and pin cherry, in experiments carried out in the autumn of 1928 and that of 1929 by the Cornell Agricultural Experiment Station. A high concentration of the chemical was required, but only small quantities were needed. Similar success resulted from experiments with sodium arsenite as a means of eliminating hawthorn from pastures. On a representative area where

hawthorn stems, averaging 7 feet in height, numbered nearly 1,500 per acre, 90 per cent of these trees were killed by a single treatment which required 1½ gallons of poison and five hours of labor per acre.

Members of the college staff have designed a new tool which will materially reduce the labor cost of tree poisoning. With this tool a single operation suffices to make the incision in the base of the tree and introduce the chemical into it.

Cornell Pine Plantation to Succeed Despite Extensive Weeviling

Weevil damage to three trees out of four need not prevent planted northern white pines from forming a final stand of high quality, according to findings presented by A. R. Mann in his 1930 report as director of the Cornell University Agricultural Experiment Station. Conclusions from a special study of weevil damage on sample plots in the Hyphen Plantation, at Ithaca, are stated by Dean Mann as follows:

Although 76 per cent of the white pines were weeviled at some time during the first 12 years in the life of the plantation, there remain a sufficient number of unweeviled trees, and trees in which the weeviling would not affect a 12-foot butt log, to form a final stand of high quality at maturity. It is expected that badly weeviled trees will be removed in successive thinnings when the plantation is between 35 and 55 years old. The department estimates that the net loss resulting from weevil injury, in board-foot volume or in income produced, will not exceed 10 per cent of the value of an unweeviled stand. No significant differences in amount of weevil damage could be found between white pine growing in alternate rows with Norway spruce and white pine growing in alternate rows with red pine.



New York county supervisors of reforestation work and others were invited to Cornell University in April of this year, as in the spring of 1930, for a 2-day tree-planting school. The instruction offered by different members of the forestry faculty had to do with sites, species, spacings, methods, fire protection, and maps and records.



Work is under way on the new science building of the New York State College of Forestry, to be called the Louis Marshall Memorial. The appropriation provided by the State for this purpose is expected to cover also the construction of a greenhouse.



Thirteen students are being graduated from the Georgia Forest School this year. The freshman class registered in the fall of 1930 numbered 33. Gordon D. Marckworth, now head of the school, is assisted by B. F. Grant and Jack Thurmond as resident instructors.

Gift Enlarges Demonstration Forest of North Carolina State College

George Watts Hill, of Durham, N. C., has added 721 acres to the 378-acre demonstration forest, located on the Roxboro highway 17 miles north of Durham, which he presented last spring to the North Carolina State College of Agriculture and Engineering. The addition consists of three separate tracts adjacent to the land given in 1930. Both the original gift area and the addition are partially timbered. The first contains some 3,000,000 feet of merchantable timber; the second has a stand of more than 4,000 cords of pine wood large enough for pulp and lumber and more than 300,000 feet of hardwoods of saw-timber size. The lands are especially well fitted for the forestry work planned by the college, says J. V. Hofmann, head of the college's department of forestry, and contain enough timber to permit a beginning in actual forest management.

The timber on the newly acquired tracts is of Virginia pine, shortleaf pine, and various species of oak, beech, birch, and maple. A considerable quantity of cedar is scattered through the stand, and some areas are expected to produce dogwood of good quality. The open areas would restock naturally with the species present on areas surrounding them, says Doctor Hofmann, but it is more desirable to introduce loblolly pine on the moist sites and to increase the percentage of shortleaf pine elsewhere. This will be done by planting seedling stock.

The forest tree seedlings to be used will be grown in the college nursery by the forestry students. They will be planted in the field partly by the students and partly on a commercial basis.

Development of the tract through its own revenue will become possible as soon as cutting operations are begun.

Six hundred acres of woodland on Mr. Hill's Quail Roost Farm is to be managed by the State college forestry department on the same basis as the demonstration forest.

Nearly Four-Fifths of Idaho Forestry Graduates Remain in Profession

Of the 103 living forestry graduates of the University of Idaho 81, or 79 per cent, were engaged in forestry work at the time of a count made by Dean F. G. Miller in September, 1930. Of the 74 men who received the bachelor's degree only, 70 per cent were still in forestry work; of the 29 who had also taken the master's degree, either at the University of Idaho or elsewhere, all had remained in forestry work. Men employed by the Federal Government made up 65 per cent of the 81 graduates still in forestry. Other groups within this number were men employed by private lumber companies, 20 per cent; members of faculties of forest

schools, 6 per cent; men in the service of foreign countries, 5 per cent; extension foresters and graduate students, 2 per cent each.

The earliest of these graduates received their diplomas in 1909.

Fire-Control Demonstrations in Rural California

For the fourth year, a series of rural fire-protection demonstrations was carried out this spring in California by Extension Engineer J. P. Fairbank and Extension Forester Woodbridge Metcalf. Between March 10 and April 27 more than 12,000 people were reached in the northern and central counties. It was planned to continue the campaign through the following three weeks.

Each demonstration occupied about 1½ hours' time. As a prelude to demonstrating several kinds of fire equipment the extension men discussed common fire hazards around the farm and in range and forest country, the effects of fires on the permanence of the forest and of agricultural industries, and effective methods of reducing fire hazard.

Accompanying the two extension demonstrators was State Forest Inspector E. B. Biggs, with one of the newest tank fire trucks of the California Division of Forestry. The State now has 16 such trucks in operation and has 7 more under construction. This truck is built up on a 1½-ton Ford chassis. A Warford transmission carried behind the regular 4-speed transmission gives a range of 12 speeds ahead and 3 reverse, making the truck very effective in rough country, on soft ground, and on mountain roads. The truck carries 150 gallons of water and is equipped with a Viking pump driven by the truck engine, the pumping capacity of which is 30 gallons per minute. It has six knapsack pump tank outfits and a number of hand fire-fighting tools.

Thirty-four students of the New York State Ranger School received their diplomas on March 11 of this year. The 1932 class of the school includes 52 students from 12 different States.

Sixty Eagle Scouts have undertaken to reconstruct the trail along the shores of Bowman Lake, on the west side of Glacier National Park, this summer. Last year 54 Eagle Scouts from 18 States completed 4,050 feet of trail in the Gunsight Pass region of Glacier Park.

Ohio 4-H forestry clubs collected more than 500 bushels of walnuts last fall for planting in State forest nurseries. The State department of forestry paid for the nuts at the rate of 50 cents a bushel.

Wisconsin Planting Demonstrations

Twenty-four Wisconsin county agents arranged 96 forest and windbreak planting demonstrations this spring, in which use was made of more than 100,000 trees provided by the State Conservation Commission. In addition planting and improvement work was conducted on 17 school forests in the northern counties by school students and members of the junior forest ranger clubs. Oneida County established four school forests and carried out several farm forest planting demonstrations without needing to avail itself of the conservation commission's offer of trees, turning instead to junior forest ranger home nurseries. Oneida is the first county in Wisconsin to have had sufficient planting stock raised by junior club members for a year's planting demonstrations.

Arkansas Fires of 1930

Of the 3,924,184 acres of forest land in Arkansas for which some kind of fire protection was provided in 1930, fires occurring in that year covered 202,829 acres, reports Extension Forester Charles A. Gillett. Fires occurring on protected land numbered 2,185. Of the 18,021,553 acres of forest land in the State for which no protection was provided, 21,094 fires covered 4,741,000 acres. Thus the proportion burned over was 26.3 per cent for unprotected land and more than 5.1 per cent for protected land.

Twenty-four senior forestry students of the Pennsylvania State College arrived in March at the permanent summer forestry camp of the Louisiana State University, about 6 miles from Bogalusa, La., for several weeks' practical forestry work under the direction of Professors Demeritt and Lutz. They visited and studied forestry operations of the Urania Lumber Co., and were expected to visit the Ouachita National Forest, Ark.

Ninety acres of wooded land is to be added to the Camp Pioneer reservation of the Hartford, Conn., Boy Scouts through the generosity of Louis R. Cheney, former mayor of Hartford. Mr. Cheney has given \$2,000 for the purchase of this addition, with which the camp-ground area will total 150 acres.

A 3-week vocational forestry camp for boys is to be held this summer at Young Harris College, in the mountains of north Georgia, by the State agricultural vocational department and the State forest service. One student from each of the counties having vocational schools will be selected on the basis of a competitive examination to attend the camp free of charge. Other boys will be admitted.

Forest Service Notes

Forest-Surveying in the Bottomlands

By C. M. GRANGER, United States Forest Service

The director of the forest survey in the bottomland hardwoods of the Mississippi Delta Region, G. H. Lentz, and his associates are fast becoming amphibian. In order to run lines across this 30,000,000 acres of "flatwoods" and take sample plots wherever they fall automatically, one has to be equally at home on land and in water. One has also to be in such a mental state that he can take seriously a "ridge" not more than 2 feet higher than the surrounding terrain and having the same topographical aspect as a tennis court, because these Lilliputian eminences cause highly important changes in forest types and growth. One must have an especially alert eye to detect the transition from one to another of the 12 forest types and to identify accurately each of the fifty-odd commercial species. And above all one must have a good disposition and a sense of humor to cope with rain, mud, swimming and wading, heat, mosquitoes, chiggers, snakes, palmetto, briars, poor drinking water if any, hominy grits, and the ubiquitous savage coffee over which visiting northerners particularly grouse.

To one whose first experience in helping organize the forest survey was in the Douglas fir region of the north Pacific coast, the Mississippi Delta hardwood bottomlands present a most abrupt contrast in conditions. The country is unbelievably flat. There are water courses big and little, and swamps in profusion. There are belts of agricultural land adjacent to most of the roads, with timber bodies of all sizes in the back country. Very little virgin timber remains. The bulk of the existing forests consists of culled or cut-over stands and second growth on old fields.

Because so little of the virgin timber remains, reliable cruises are in existence for only a minor fraction of the territory. In general, therefore, the inventory of forest resources has to start from scratch. A method similar to that used in the forest surveys of Sweden and Finland seems likely to be the most fruitful, so a linear system of survey has been adopted and is now being tried out in two adjoining compact parishes (counties) in northern Louisiana.

In this first test lines are being run 3 miles apart, east and west, with sample plots every 10 chains. For the merchantable timber the sample plots are one-quarter acre, for the timber below merchantable size one-twentieth acre, and for small reproduction one-one-hundredth acre. Along the line, which is run with a compass and chained, a linear record is kept of the physical forest sites (ridge, flat, swamp, etc.) and the condition of the forest (virgin, culled, cut over,

etc.). On the sample plots records are made of the type, species, volume, log grades, growth, soil, drainage, etc. Special plots are taken for damage data. Records are kept also for the agricultural areas to show the general quality of the land and the portions reverting to forest, as an indicator of the probable addition to the forest lands from farm-land abandonment.

Out of this preliminary test, after statistical analysis of the results, will come a final determination as to what interval between lines and sample plots will make it possible to obtain acceptably accurate figures on area, volume, and other major factors in the forest survey.

With only twenty-three thousand and odd dollars of Federal funds available per year for this work so far it will be slow going to cover the whole 30,000,000 acres. It is hoped to raise additional funds through cooperation with the States and with other agencies directly interested.

Tractor Logging in the California Pine Region

By B. O. HUGHES, United States Forest Service

The success with which tractors replaced horses in agricultural work suggested the use of tractors in California pine logging. Tractor logging was introduced in the comparatively flat country of northeastern California in 1922, and rapidly supplanted both horse-drawn and steam equipment there. In the past three or four years tractors have invaded the west slope of the Sierra, and they are now being used wherever the topography will permit. Two-thirds of the cut in the pine region is now handled with tractors.

The change from horses to tractors eliminated the need for the large crews of workmen that had been required to clear roads for horse-drawn wheels. It also eliminated the heavy expense of caring for horses through months of idleness. Tractors hauled larger loads and hauled them faster than horses could. Tractors had an advantage over steam equipment, too, in lower labor costs, greater flexibility, and, last but not least, much lower fire risk.

Operators who pioneered in tractor logging had their share of disappointments. Big wheels built to be drawn by horses had not the strength for tractor logging. Tractors built for agricultural use were not sturdy enough for use in the woods, and under severe conditions and unskillful handling were constantly breaking down. But manufacturers taught loggers how to care for their machines; and loggers taught manufacturers something about design, with the result that improvement took place every year both in tractors and in tractor equipment.

Several studies have been made to determine just what destruction occurs in this type of logging, how it occurs, and how it can be reduced. In a stand averaging 27,000 board feet per acre, of which 19,000 feet was marked for cutting, it was found that 62 per cent of the young growth under 4 inches in diameter, 82 per cent of the poles between 4 inches and 12 inches in diameter, and 95 per cent of the reserved trees more than 12 inches in diameter survived logging. This compares very closely with the results of horse-drawn big wheel logging. In both cases all loss in diameters of more than 12 inches and a large part of the loss between 4 and 12 inches was due to timber felling. A study made on a modified high-lead setting on the west slope of the Sierra furnishes a picture of the results obtained in regulated donkey logging. In a stand averaging 76,000 board feet per acre, of which 65,000 feet was marked for cutting, it was found that logging was survived by 25 per cent of the young growth under 4 inches in diameter, 57 per cent of the poles between 4 inches and 12 inches in diameter, and 76 per cent of the reserved trees more than 12 inches in diameter. This comparison is not entirely conclusive, since the stand and topography were different in the two cases. However, there is no doubt that tractor logging results in much less damage to trees of the higher diameters than does donkey logging. Injury and even total destruction run high in the diameters above 12 inches when donkeys are operated. Tractors never destroy trees of that size and comparatively seldom injure them.

The latest innovation in tractor logging equipment is known as the "fair-lead wheel." A tractor is equipped with a single drum winch, the cable from which runs over a roller (called a fair lead) supported by a high-arched axle mounted on crawler-type wheels. In operation the wheels are backed as close as convenient to the logs as they lie in the felled tree. A wire choker is placed about each log and hooked to the end of the cable until enough logs have been attached to make up a full load. By means of the winch the tractor driver reels the logs into position under the arch with their front ends suspended. The winch brake is set and the load is ready to move. A study made by the United States Forest Service indicates that logging by this method, if properly supervised, results in less damage than other kinds of tractor logging.

It should be borne in mind that the studies here referred to were made on national-forest sale areas under some degree of regulation. The results represent what can be expected of tractor logging when it is the operator's intention to save as much as possible of the advance growth. In other words, they point to possibilities rather than give a picture of what is actually happening on tractor-logging operations. The value of the future forest resources of California depends not so much on what the Government does as on how private owners handle their timberlands. By using the tractor, operators can leave their cut-over land in condition to produce successive crops of timber.

Forest Service Pledged to Conserve Scenic Beauty of Forest Roads

By L. F. KNEIPP, United States Forest Service

Within the last decade, or more exactly the last five years, public demand for recognition of the æsthetic and recreational values of roads has developed a new point of view on the part of road-building agencies. Since the traveling public contributes in large degree to the costs of national-forest road construction and maintenance, its desires with respect to the æsthetic aspects of road location and of the management of lands abutting upon and visible from roads deserve attentive consideration.

Location of roads on national forests, as elsewhere, has hitherto been conceived as exclusively an engineering function. Speed and economy of transportation, and economy of construction and maintenance, have been dominant considerations. The obvious desirability of avoiding or holding to the irreducible minimum unsightly cuts and fills has not governed location to such an extent as it should. Until quite recently, the recreational and inspirational aspects of road service have been subordinated. There have been few studies of available scenic resources with the intent to realize their potentialities most fully by proper correlation of road construction, no established practice of consulting experts in landscape planning or recreational development. It is evident that a new order is necessary; the fact that much use of each road will be recreational in character must be recognized, and the development of scenic, inspirational, and recreational assets must be a major factor in the planning of road systems and of particular roads.

Impairment of æsthetic qualities of abutting lands has usually been coincident with the initiation of road construction. The gravel and borrow pits, rock quarries, rock crushers, stock piles, oiling stations, camps, etc., have customarily been located within the right of way or on land immediately contiguous to it. All too often construction work has been terminated with little effort to remove or cover over these eyesores. Bridge and other structural timbers have been cut from trees which, in place, would have been scenic gems. Clearings of timber have frequently been much wider than was necessary, leaving ugly expanses of stumps in place of the intimate touch of the forest. Logs, stumps, and brush resulting from the clearings have not always been disposed of, and where disposal has been attempted the fires have sometimes destroyed contiguous forest cover. Permanent road-maintenance stations, with attendant stables, garages, etc., frequently have been constructed in close proximity to the roadside when they might just as readily have been located out of sight behind a fringe of trees.

Following road construction the next detrimental factor has been the erection of numerous signs which in form, design, and colors were wholly incompatible with their environment. Primarily these were of an

advertising character, but in many instances they described the road and the agencies by which it was constructed. Another inharmonious development has been the construction, in close proximity to the right of way, of business or residential structures the design, color, or use of which markedly impaired natural beauty, or the dedication of abutting lands to forms of use incompatible with realization of the full scenic and inspirational qualities of the road. Still another inharmonious use has been that of unregulated, sometimes unauthorized, timber cutting upon lands contiguous to the roads and visible from them, often resulting in total elimination of scenic beauty and natural interest.

The Forest Service can justly claim that it was one of the first public agencies to realize that these practices were an offense against the public interest and take steps to prevent their further occurrence. To preserve the beauty of a road leading into the Yellowstone National Park, the Forest Service, nearly a quarter century ago, modified its practice of marking the trees to be cut on one of the first large sales ever made under its direction. A full decade or longer ago the service began to stress the need for so locating roads as to realize most fully their value for the development and enjoyment of scenic and recreational resources. For more than a decade the preservation of timber fringes along main traveled roads has been a cardinal principle of national-forest timber management. More than a decade ago the service began to control advertising signs upon national forest lands and initiated a system of official signs that would not impair natural beauties. Almost as long ago it began to emphasize the need for care in road construction so that the beauty of abutting lands might not be destroyed, and to require that the unavoidable disturbance of natural conditions by borrow pits, quarries, camps, etc., should so far as practicable be remedied before the construction job was regarded as complete. Almost as long ago it began to restrict more closely the authorized use for private purposes of lands closely adjacent to the roadsides.

Not all the objectionable roadside conditions observed within national forests are chargeable to Forest Service administration. There is almost 24,000,000 acres of privately owned or State land within the national forests, much of it traversed by roads. Such land is not under the jurisdiction of the Forest Service and may be used or occupied as the owners or tenants see fit.

Then, too, the ease and freedom with which the present mining laws of the United States permit individuals to establish rights of occupancy upon national-forest lands militate against proper control of roadside values. Many locations are made for business purposes, and until declared invalid are subject to uses seriously destructive of roadside values and beauties.

It would be a mistake to assume that the maximum inspirational value and interest can be derived only

from stands of timber which are absolutely untouched. There are some roads where a single forest type such as lodgepole pine extends monotonously mile after mile, where variation in size or age classes induced by good silvicultural practice would enhance rather than diminish beauty and interest. There are other instances in which a high educational value and increased public interest would result from roadside examples of good forestry practice typifying principles of silviculture, utilization, and slash disposal. In still other cases the controlled removal of dead or decadent trees, or trees of inferior and unsightly species, would enhance not only the beauty but the safety and service of the road. The admittedly desirable preservation in unmodified condition of examples of virgin or veteran tree growth frequently will necessitate special technical measures against damage by disease, insects, fire, etc.

Each highway is a problem in itself, with features peculiar to it. The conservation of the beauty of adjoining lands can not be accomplished by dedicating to road use a certain arbitrarily chosen width of right of way. On the contrary, the desired result can be obtained only by a detailed and planwise study of land status, a classification of the abutting lands on the basis of their highest use, æsthetic as well as commercial, and the formulation of specific plans to govern all subsequent use and occupancy. The width of the abutting strips related to the public enjoyment of a road vary markedly. Where hillside locations command wide views, large areas should be regarded as appurtenant to the road; while in narrow canyons or in gulches which bench or terrace, relatively narrow strips suffice. On extensive slopes where roads swing or switch back several times with the several tangents in close proximity to each other, an arbitrarily established width of right of way would be confusing and ineffective, and the extent to which the entire slope is involved in the æsthetic problem is determined by the nature of the cover and degree of visibility.

As a means of conserving the scenic, inspirational, educational, and recreational qualities of national forest lands contiguous to highways and roads, the Forest Service has pledged itself to the following measures:

All national forest lands within 200 feet of the center line of a Class A¹ or Class B¹ highway, or within 100 feet of the center line of a Class C¹ highway or road, shall be administered with the major objective of conserving and augmenting the scenic, inspirational, educational, and recreational values of said lands and roads, and no form of occupancy or use of said lands or the products thereof shall be allowed except with the prior approval of the regional forester or the Forester, who, before granting such approval, shall require full assurance that the proposed occupancy or use is necessary, is appropriately safeguarded, and will not result in a sacrifice of public values or services

¹ Class A roads are Federal highways; Class B roads, State highways; class C roads, county and community roads.

greater than the public values or services to be derived from such occupancy or use.

While the proposal to acquire all timbered lands contiguous to highways by granting national-forest stumpage in exchange therefor is regarded by the Forest Service as impracticable, the acquisition of areas of privately owned forest land within the boundaries of the national forests for the purpose of conserving roadside beauty will be accomplished as rapidly as such lands can be acquired through exchange with due regard to other requirements of public interest.

The detailed and systematic planning of the management and use of all national-forest lands tributary to class A, B, or C roads, including not only the 400 or 200 foot strips but such other lands as may affect the public value of a given road, will be regarded as a definite and current administrative function of the Forest Service, to be carried to consummation as rapidly as the available personnel and funds and other administrative obligations will permit. National park approach roads will be given initial consideration. Project plans will be personally considered by the regional forester and when approved by him will thereafter govern all occupancy and use of the lands involved.

Phenological Study in the Northern Region

A Forest Service study of plant-life phenomena as related to seasonal weather conditions has been in progress in Montana and northern Idaho for the past three years. At 33 stations on national forests and at 2 stations on national parks 24 forest officers and 2 other observers have been recording the time of leafing, pollination, cone opening, leaf fall, and similar phenological events. Twelve species of conifers, 19 species of hardwoods and shrubs, and 19 species of herbaceous plants, all prominent in the flora of the region, are being followed. (In each of these groups a few plants have not been observed over a range wide enough to warrant compilation of records for the region.) Data have been taken on 16 events for each conifer and 9 for each hardwood, shrub, or herbaceous plant.



The office of forest products of the Portland, Oreg., regional office of the Forest Service has been combined with the Pacific Northwest Forest Experiment Station, at Portland. W. H. Gibbons, formerly in charge of the office, is now assigned to the Washington, D. C., headquarters of the service as a specialist in economics, to handle matters having to do with the national drain-on forest growth; his three assistants, A. H. Hodgson, H. M. Johnson, and H. R. Spelman, have joined the staff of the experiment station. This station is now conducting work in four fields: Silviculture, forest survey, economics (insurance), and products.

Calcium Chloride as a Fire Retardant

In tests conducted by Paul Stickel, of the Northeastern Forest Experiment Station, a 4-foot firebreak covered with calcium chloride which had thoroughly deliquesced was effective in stopping a grass fire at most points. Where the fire did enter the treated firebreak little effort was required to bring it under control. The fire was set in the early afternoon and at the height of the fire season. The quantity of dry calcium chloride used in treating the firebreak was 2 pounds per square yard.

It was found that to serve effectively as a fire retardant the calcium chloride must have time to deliquesce. The time required for deliquescence varies with atmospheric conditions. Under conditions such as exist in the Northeast, one night is the minimum required. After heavy rains no trace of the compound was found on the surface.

A Movable Map Board for the Lookout

By L. H. REINEKE, United States Forest Service

It sometimes happens that a fire lookout, sighting on a fire through his alidade to determine its direction, finds his view obstructed by the corner posts of the lookout cabin. It is desirable in such cases to move the map board a small distance to obtain a clear view, but it is essential to keep the map oriented perfectly. Devices now in use do not maintain perfect orientation.

A simple device that obviates this difficulty consists of four metal arms about 7 inches long, having a hole one-half inch from each end, and eight pivots. Four pivots are fastened to the table, at the corners of a rectangle somewhat smaller than the map board. The other four are attached to the bottom of the map board, spaced exactly as those on the table. Each of the metal arms is fitted to a pivot on the table and to the corresponding pivot on the map board. This system constitutes a set of four "parallel rulers" arranged to form a rectangle. The map board retains its original orientation regardless of the direction in which the four arms point and the total movement is twice the length of the arms, or 12 inches.

By using arms of other lengths any desired range of movement up to nearly twice the smaller dimension of the board can be obtained.



Four lookout towers are being constructed on the Sacramento Canyon district of the Shasta National Forest, Calif. With these towers added to the four already in use, 84 per cent of this 400,000-acre unit will be directly visible from one or more towers. Areas that will be directly visible to lookouts when the towers now under construction are completed include 90 per cent of those on which fires have occurred in the district since intensive protection was instituted.

A Dendrometer that Costs Next to Nothing

A screw hook, a screw, and a dial micrometer gage become the means of accurately measuring tree growth when used according to a scheme devised by L. H. Reineke, of the California Forest Experiment Station. The screw hook must be of the type having the end bent at right angles to the shank. This hook is screwed into the wood of the tree, a little to one side of the point at which growth is to be measured. A very small screw is inserted into the bark only, directly in line with the end of the bent-over part of the hook. The distance between the head of this screw and the end of the hook is measured with the micrometer gage. As the bark is pushed outward by the growth of the tree it carries the screw with it, while the screw hook retains its original position. The distance from screw to hook at the first measurement minus the distance between them at any later time represents the radial growth during the intervening period.

The growth readings, which are made to one-thousandth inch, are not affected by expansion and contraction of the stem due to the pull of transpiration as are those made with the MacDougall type of dendrometer.

Each set of screw hook and screw costs only about 2 cents and the micrometer gage, which can be used to measure growth at any number of points, costs but \$16.50. A single dendrometer installation of the usual type costs \$250.

Growth in Western Yellow Pine Type Following Thinning on the Prescott

By QUINCY RANDLES, United States Forest Service

Five years after an experimental thinning operation in the western yellow pine type on the Prescott National Forest, Ariz., remeasurement of the trees on the thinned plot and on an unthinned plot has brought out evidence that, other things being equal, a forest tree's capacity for growth is proportional to its effective crown area and root area. The thinning plot and the control plot, of 4.2 acres and 0.8 acre, respectively, were established in 1925 and remeasured in 1930 by the Southwestern Forest and Range Experiment Station. In 1925 the thinned plot contained 283 trees per acre, mainly between 3 and 12 inches in diameter at breast height; the unthinned control contained 772 trees per acre, mainly between 2 and 11 inches in diameter at breast height. Stump counts in 1925 indicated an average age of 41 years, a few trees being as much as five years above or below the mean.

The average diameter growth of all trees for the 5-year period was 0.58 inch on the thinned plot and 0.26 inch on the unthinned plot. In both thinned and unthinned plots the greatest average accretion was in the higher diameter classes. In each diameter class the growth was consistently about 0.2 inch greater on

the thinned plot than on the unthinned plot. Growth on the thinned plot was closely associated with condition and size of crown.

In regard to condition and size of crown in 1930 the trees were classified on the basis of the appearance of foliage and an ocular estimate as to spread and length of crown in relation to diameter at breast height. The method is admittedly crude, but it is the only one that can be used quickly in timber work.

Relative growth by crown classes in the 5-year period is shown in the following table.

Crown class		Number of trees	Average diameter growth (inch)	Trees growing more than 5 inches (per cent)	Increment shown by maximum percentage of trees (inch)
Condition of crown	Size of crown				
Good	Large	165	0.83	88.0	0.8
	Medium	619	.62	60.0	.6
	Small	94	.39	12.8	.4
Fair	Medium	83	.48	30.1	.5
	Small	86	.36	7.0	.3
Poor	Medium	21	.31	4.8	.2
	Small	46	.26	6.5	.3

Growth of Planted Redwood Slow at the Start

Redwood trees planted from 1923 to 1925 by lumber companies in the redwood region of California were found this year to range from a few inches to 7 feet in height. Their average height as estimated by H. L. Person, of the California Forest Experiment Station, was less than 3 feet. Sprouts of the same age would average between 15 and 20 feet in height. Many thrifty trees were found growing in practically complete shade. A very high percentage of the trees damaged by fire were sprouted. On some of the areas natural seedlings, both redwood and Douglas fir, give promise of being an important factor in restocking cut-over lands.

Campaign Against Bark Beetle in Intermountain Region

Eighty national forest officers of the Intermountain Region, with 300 temporary employees, started out in April of this year in a campaign against the bark beetle which was expected to last into June. The method of attack, used in the region last year in treating 74,000 infested trees, was to spray the trees with oil and burn them standing. It was planned to give this treatment to 60,000 lodgepole pine trees on the Wyoming, Teton, Targhee, Caribou, Minidoka, Cache, Ashley, and Wasatch National Forests. Approximately 1 gallon of oil is required for each tree. Exclusive of the salaries of the forest officers, the work was expected to cost about \$80,000.

Court Order Protects Rangers In Killing Branded Horses as of Unknown Ownership

A perpetual injunction issued April 9 by Federal Judge Fred C. Jacobs, of the District Court of Arizona, restrains the county attorney and sheriff of Navajo County, Ariz., from arresting or prosecuting forest rangers on the Sitgreaves National Forest for killing horses, whether unbranded or branded, in areas of the forest closed by the Secretary of Agriculture to the grazing of horses. Injunction proceedings grew out of the arrest of Ranger D. E. Slosser for killing two horses that were found grazing on an area so closed. Within the meaning of the Secretary's order, the court held, a "wild horse" may be either an undomesticated animal or a domesticated animal living in a wild state, and a horse in trespass is "of unknown ownership" if the officer executing the order does not know the ownership and would be unable by the exercise of reasonable diligence to ascertain it.

National Forest Lands Set Aside for Research Use and for Perpetuation of Primitive Conditions

Five areas of national-forest land have recently been designated by the Forester as experimental forests, permanently dedicated to research use. The first is the Gale River tract on the White Mountain National Forest, N. H., which is representative of the spruce-hardwood forests of New England and is conveniently located for study of the pulpwood forest problems of that section. This area includes approximately 1,320 acres. It lies between two State highways, a few miles west of Mount Washington. The Northeastern Forest Experiment Station, at Amherst, Mass., has had investigations under way on the area since July, 1927.

The Fort Valley Experimental Forest of 2,420 acres on the Coconino National Forest, 10 miles from Flagstaff, Ariz., is representative of the western yellow pine type.

The Priest River Experimental Forest of 6,355 acres in northern Idaho, on the Kaniksu National Forest, represents the western white pine type. For the past 20 years this area has been used by the Northern Rocky Mountain Forest Experiment Station, Missoula, Mont., as a field laboratory for studies of fire protection and silviculture. It is within easy reach of Spokane and other eastern Washington and northern Idaho towns.

The Bernice Experimental Forest of 2,880 acres on the Deerlodge National Forest, near Butte, Mont., is representative of the lodgepole pine type. This area, likewise, will serve as a field for investigative work by the Northern Rocky Mountain Forest Experiment Station.

The Bent Creek Experimental Forest of 1,110 acres on the Pisgah National Forest, 10 miles from Asheville, N. C., exemplifies the southern hardwood type. Considerable work has already been put in progress on this forest by the Appalachian Forest Experiment Station. Cull timber and second growth occupy a large part of its area. The chestnut has been killed out by blight. The forest is typical of much mountain country in the Appalachian region. Good markets exist in the neighborhood of the forest for all material likely to be produced on it.

Under the same Forest Service regulation of 1930 that provides for the establishment of experimental forests, in the past eight months 28 tracts of national-forest land having an aggregate area of 4,056,733 acres have been set aside as "primitive areas." These lands are located principally in the Rocky Mountains and in the Pacific Coast States. Only one of them is less than 13,444 acres in extent; the largest has an area of 1,087,744 acres. On these lands it is the purpose of the Forest Service to maintain primitive conditions of environment, transportation, habitation, and subsistence, with a view to conserving their value for purposes of public education and recreation.

Under the third classification provided for in the regulation referred to, three national-forest tracts have been set aside as "natural areas," to be retained in an unmodified condition for purposes of research and education. These are the Chiminea Canyon of about 160 acres and the Pole Bridge Canyon of about 320 acres, both on the Coronado National Forest, Ariz., and Heart's Content, an area of 120 acres on the Allegheny National Forest, Pa. The Chiminea Canyon area contains distinctive types of cacti and other desert vegetation; the Pole Bridge Canyon area contains specimens of certain forest trees that have a very restricted range, such as Apache pine, Arizona pine, and Chihuahua pine, and also of live oak, walnut, sycamore, madrone, and other tree species typical of southern Arizona; the Heart's Content area contains one of the very few remaining stands of old-growth northern white pine.

Growth of Douglas Fir on the Cascade

Second-growth Douglas fir timber on the Cascade National Forest, Oreg., that was measured at the age of 54 years and again at the age of 74 years showed a volume increase of 78 per cent within the 20-year interval, reports the Pacific Northwest Forest Experiment Station. Measurements were made on three 1-acre plots, the Scribner scale being used. In 1910, the year of the first measurement, the volume of the timber on the three plots averaged slightly more than 33,000 board feet per acre; in 1930 it averaged more than 59,000 board feet per acre. Between 1910 and 1930 the average height of the trees increased by from 25 to 30 feet and their average diameter increased by more than 4 inches.

Buildings for Research Use are Part of Program for Unemployment Relief

As part of the Forest Service program of unemployment relief the following buildings are being constructed for use by forest experiment stations: At the Bent Creek experimental forest of the Appalachian station, 3 laboratories, 1 greenhouse, 1 bunkhouse, 1 superintendent's house; at the Kane experimental forest of the Allegheny station, at Kane, Pa., 1 laboratory, 1 superintendent's house; for use by the Lake States station, at the Cass Lake nursery, on the Chippewa National Forest, Minn., 1 field laboratory, and on the University of Minnesota campus, 1 greenhouse. In addition, several smaller structures for the use of experiment stations are being erected at various points in the Southwest where field observations are under way and at the Devil's Canyon nursery in southern California.



An area of nearly 1,000 acres of round second-growth pine timber within the boundaries of the Osceola National Forest, Fla., has recently been purchased by the Government with the purpose of providing an experimental tract for the use of the Southern Forest Experiment Station. The projected experimental forest is to include 3,000 acres of contiguous land not yet purchased by the Government. Work to be conducted on it by the experiment station will include both naval-stores and silvicultural practices. On this tract, also, will be centered the investigative work which the Forest

Products Laboratory has under way on the Osceola Forest.



The conditional award made to the International Paper Co. covering the purchase of pulpwood and other timber from two large tracts on the Rio Grande and San Juan National Forests, Colo., has lapsed, the company having failed to meet certain stipulations and sign the formal timber-sale agreement by April 1, 1931. The timber is now open to purchase, at private sale, at the highest price bid by anyone who can meet the conditions of sale.



Norway pines planted along certain county highways in Iron County, Mich., have browned and died following treatment of the roads with calcium chloride during last summer's drought. When dying needles from such trees were examined by the Lake States Forest Experiment Station no large quantities of the salt were found on them, but the needles bore every indication of having been desiccated by particles of this material mixed with dust.



A study of Virginia pine has been initiated in north Georgia by the Appalachian Forest Experiment Station. Preliminary investigation has shown that well-stocked stands from 25 to 45 years of age are capable of producing a yearly average of from 1 to 1½ cords of pulpwood per acre. As much as 75 cords per acre has been cut on timber-sale areas on the Cherokee National Forest.

General Forest News

Early Turpentining with Cup and Gutter

By W. R. MATTOON, United States Forest Service

As early as the sixties J. C. Schuyler experimented with the cup-and-gutter method of turpentining on land near Georgetown, S. C. One of his cups is now in the possession of Charles H. Herty, of the Chemical Foundation (Inc.), New York City. Mr. Schuyler obtained a patent on his cup in 1867.

In 1894-95 W. W. Ashe, then in charge of forest investigations for the North Carolina Geological Survey, made use of zinc cups and gutters in turpentining longleaf pines near Bladenboro, Bladen County, N. C. He cut a groove on each side of the face with a hand-saw, inserted zinc strips or gutters, and hung a cup just beneath the lower gutter. More than 100 such cups were hung and used for two seasons. Mr. Ashe's full account of this experiment is found on pages 100-104 of North Carolina Geological Survey Bulletin No. 5, published in 1904. Mr. Ashe obtained a gain of 15 per cent in the quantity of gum, or 35.8 barrels of gum

more than the then prevailing average of 250 barrels per crop, and also a better grade of gum. The increase in value of yield amounted to 20 per cent.

For some years prior to these experiments in America the French system of turpentining, practiced on maritime pine in France, had consisted in using small cups and gutters on very narrow faces. American turpentining practice at that time was restricted to large-sized trees with very wide faces, so that in the early cupping tests in this country the French cupping method was greatly modified.

Samples of gum obtained by cupping which Mr. Ashe sent to the department of chemistry of the University of North Carolina attracted the interest of Charles H. Herty, then head of the department. The story is well known of Doctor Herty's epoch-making demonstrations, conducted over a period of years, of the advantages of the cup-and-gutter method over the very wasteful and destructive boxing system. It was in April, 1901, at Ocilla, Ga., that Doctor Herty hung his first cup.

Wild-Animal Damage to New England Forests

Deer in New England are doing considerable damage to forests, particularly to young plantations, reports a committee appointed in 1930 by the New England section of the Society of American Foresters to study wild-animal damage to forests in that region. According to the findings of this committee, which was headed by Neil W. Hosley, deer are now fairly plentiful practically throughout rural New England. Deer damage is reported as important only in Rhode Island, central and northern Connecticut, and a few sections of Massachusetts.

The deer damage the trees principally by browsing on the buds, leaves, and tender shoots at heights below 6 feet and usually below 4 feet. On 75 per cent of the trees reported as injured by deer in Connecticut, the damage took the form of nipping off the leaders. In some cases deer were reported to have barked small trees in rubbing the velvet off their antlers.

Practically all the native forest-tree species, both conifers and hardwoods, and most of the exotics commonly used in the region, are reported to have been fed upon by deer. The only conifer reported to the committee as immune was white spruce, and the fact that no instance was known of damage to this tree may be due to the fact that comparatively small quantities of it are planted. Of the hardwoods, white ash is especially liked.

Damage by deer takes place principally when the ground is covered with snow, and is greater in severe than in mild winters.

The nipping of an occasional leader from a spruce has little effect; but if northern white pine, for example, is heavily browsed its growth may be almost arrested.

Deer damaging crops may be killed at any time in all the New England States except Massachusetts, but in none of the laws authorizing such killing are forest trees mentioned as a crop. Each of the States except Connecticut and Rhode Island has an open season on deer, with one deer as the legal limit.

The porcupine is believed by the committee to do more damage to forests in the Northeast than any other animal within its range, which includes all New England north of southern Massachusetts. Porcupine injury is most prevalent in sections where ledges and rocks give cover, but where food is available the porcupine makes its home in old buildings, hollow trees or logs, or drains beneath roads. Forest damage by this animal is particularly severe over the Vermont mountains and through all of rural New Hampshire, especially in the northern part. Throughout its range the porcupine lives on the bark of trees through the fall and winter. Observations indicate that it will bark any species of tree. In some places it prefers hemlock; in others, hardwoods. At Petersham, Mass., it seems to find European larch especially attractive.

In some cases porcupines cut off branches so severely as to ruin the trees. A tree from which a patch of bark is removed would often heal successfully if left alone; but the porcupine seems to enjoy greatly the callous tissue that develops at the edge of the wound, and is apt to return to the same tree year after year, finally girdling it. In extreme cases a stand covering several acres is ruined.

Porcupine control by poisoning, which has been practiced with success by the Bureau of Biological Survey, can not be introduced into New England because poisoning of any sort is illegal in all the New England States. Hunting during the winter is ineffective because the animals usually spend the daytime in their dens. Trapping is effective but is unduly expensive where the distribution is general and widespread. Massachusetts law prohibits the use of steel traps except within 50 yards of cultivated land. Maine alone has a bounty law now in effect; this is reported to be working well.

Rabbits are accused by the committee of sometimes damaging forests in New England, living on the bark and buds of small woody vegetation during the winter. They are seldom numerous enough, however, to cause serious damage. In southern Connecticut rabbits are reported to do more damage than any other animal. In one 3-acre plantation of Norway and Scotch pine on Martha's Vineyard every tree was topped by rabbits.

Damage by the red squirrel is said to be important though inconspicuous. It has been identified in Connecticut, Massachusetts, and southern New Hampshire. During periods of deep snow when the squirrel can not get its usual food, it feeds on the buds of Scotch pine, Norway spruce, European larch, and northern white pine. Trees only a few feet tall are attacked, and the upper limit of damage is unknown. Another offender is the mouse, which during occasional periods of overpopulation sometimes girdles young planted trees, especially Scotch pine.

The only bird complained of by the committee as damaging forest trees in the region is the grosbeak, which feeds on the buds of hardwoods and some conifers such as European larch. The grosbeak can not cut buds from branches too slender to support its weight, and so its feeding has little adverse effect on growth of older trees of most species.



A permanent station for research in soil erosion is to be established during the summer of 1931 in southern Wisconsin, through cooperation of the University of Wisconsin and the Federal Forest Service, Bureau of Chemistry and Soils, and Bureau of Public Roads. For the support of the work during the fiscal year 1932 a Federal appropriation of \$15,000 has been made available and \$10,000 has been allotted from university funds.

Government Revises Specifications for Preservative Treatment of Wood

Specifications under which wood products treated with preservatives are purchased by the United States Government were reconsidered during 1930 by the technical committee on wood preservation of the Federal Specifications Board. (This committee has as its chairman R. K. Helphenstine, jr., of the Department of Agriculture, and includes representatives of the Treasury, War, Navy, and Commerce Departments and the Panama Canal.) As a result some revisions have been proposed by the committee and approved by the Federal Specifications Board. Aside from being divided into five parts, the revised specifications differ only slightly from those adopted in 1926. In certain cases a somewhat heavier absorption is stipulated, and a specification for zinc chloride treatment of lumber for building construction has been added. The specifications remain largely identical with those of the American Wood Preservers' Association. The schedule of recommended practice in the preservative treatment of timber which forms a part of one of the revised specifications can be obtained by writing to R. K. Helphenstine, United States Forest Service, Washington, D. C.

Washington's Douglas Fir Mine Timber Production

About 2,500,000 lineal feet of round, peeled Douglas fir mine timbers, commonly called Jap piling, are produced annually in the State of Washington for shipment to Mexico. These timbers have a minimum top diameter of 4 inches and a maximum butt diameter of 10 inches. They are cut in 18, 20, 22, and 24 foot lengths. Douglas fir mine timbers prepared in Washington for local use vary from 6 to 12 inches in top diameter and from 6 to 14 feet in length. At present the bulk of this material is cut from farm woodlands. Round and split Douglas fir mine timbers produced in the State annually amount to about 4,250,000 lineal feet.

Very successful plantations of longleaf, slash, and loblolly pine have been established by the Industrial Lumber Co. since 1928 on 5,000 acres of its cut-over land near Elizabeth, La. Firebreaks divide the plantations into 160-acre blocks.

The American Smelting & Refining Co. of Tacoma, Wash., uses about 36,000 lineal feet of green Douglas fir poles weekly in the smelting of copper ore. The green poles, 25 to 28 feet long and 7 to 11 inches in butt diameter, are placed in the molten ore to facilitate the separation of the copper from the slag.

Sawmilling for 102 Years

By W. R. MATTOON, United States Forest Service

On the banks of the Mississippi River at Natchez, Miss., is a sawmill plant that has been operated continuously by the same family for more than 102 years. It was established in 1828 by one Andrew Brown, a native of Scotland who had mined gold in Australia. In 1865 B. F. Learned, the founder's son-in-law, entered the business and the word "company" was added to the name of Andrew Brown. Since 1871 the firm has borne the name of Learned. The present head is Andrew Brown Learned, a grandson of the founder.

The mill's output is some 60,000 to 100,000 board feet daily. The lumber, which is of cottonwood and willow with a little cypress, is manufactured accurately and graded scrupulously. "If Mr. Learned caught a man doping the grade he would fire him," the mill superintendent told me. "A man that will cheat the customer will be likely also to cheat the company." The plant is in splendid shape from top to bottom. The mules at work about the mill are of exhibit grade. The lumber piles are models. Everywhere around the plant is evidence of care, accuracy, and honesty in cutting logs into lumber and merchandising the product.

The visitor is shown the time-worn cash-account book of Andrew Brown dating from March 1, 1829, the year after operations started. It shows painstaking attention and pen work. Incidentally, those were the days of slave labor. One entry reads "September 25, 1829. Paid for Boneypart—\$600." For those days of real money the company's cash-account book shows many items ending in one-half cent or three-fourths of a cent.

The Chicopee Manufacturing Co. recently planted 20,000 loblolly pine seedlings on abandoned farm land within its holdings near Gainesville, Ga. This is the third year in which the company has carried out planting operations in accordance with a plan prepared by the Georgia Forest Service for the management of its forest land. The company has 3,000 acres of land under organized fire protection. All open areas that will not restock within a satisfactory length of time are being planted with seedlings purchased from the State nursery at Athens.

Six caterpillar tractors are being used by the Simpson Logging Co. in a selective cutting operation in Douglas fir near Shelton, Wash. Athey trusses are employed for yarding and a specially built steam jammer for loading. With this equipment it has been possible to remove groups of trees of saw-timber size without any considerable damage to dense young growth surrounding them.

Satin Moth Quarantine Area Enlarged

An amendment to the satin moth quarantine regulations effective February 1 increased the regulated area by more than 9,000 square miles. The greatest addition in any State is 6,713 square miles in eastern Maine. Other sections added include 21 towns of central New Hampshire, 10 towns of eastern Vermont, 21 towns of western Massachusetts, and 38 towns of central Connecticut. No change was made in the regulated area in the State of Washington.

The satin moth feeds on the leaves of poplar and willow trees. The caterpillars pass the winter on the bark of the trees, in webs so small and inconspicuous

that it is impracticable to determine their presence by inspection. Accordingly, it is necessary to prohibit shipment of poplar and willow trees from infested areas.



Legislation approved in the closing hours of the Seventy-first Congress provides for making a national park of Isle Royale, in Lake Superior. Because of the rugged formation of this island its old-growth timber has remained uncut. Its wild life includes moose, caribou, beaver, and deer. Lands already in public ownership make up 9,121 acres of the island's total area of 123,520 acres, 2,240 acres being in State ownership.

Foreign Notes

Sweden's National Forest Census

Productive forest land composes 57,000,000 acres of Sweden's total land area of 101,000,000 acres, according to results of the national forest inventory carried out in 1923-1929. This figure omits land occupied by broad-leaved forests above the coniferous timber line and other land having a wood-producing capacity of less than 14.3 cubic feet per acre per year. The survey showed that the total volume of wood (exclusive of bark) in the forests of Sweden is 50,062,000,000 cubic feet and that the annual increment (exclusive of bark) amounts to 1,683,000,000 cubic feet. The latter disclosure put to rest the fear formerly felt by Swedish foresters that timber was being removed from the nation's forests faster than it was being grown.

Of the productive forest land 4,776,937 acres was pronounced to be in need of drainage; 2,397,117 acres of it was being pastured.

The average number of trees 10 centimeters or more in diameter outside the bark at breast height was 424 per hectare of productive forest land; that of trees 20 centimeters or more in diameter was 89 per hectare. The peeled volume of trees at least 10 centimeters in diameter totaled 1,236,380,000 cubic meters, averaging 51.8 cubic meters per hectare. Of this total volume 527,610,000 cubic feet was pine, 515,540,000 cubic feet was spruce, and 142,600,000 cubic feet was birch. Annual growth (exclusive of bark) for all trees except broad-leaved trees of less than 5 centimeters diameter outside bark aggregated 47,651,700 cubic meters and averaged 1.99 cubic meters per hectare of productive forest land. This total included 18,157,100 cubic meters of pine, 19,812,500 cubic meters of spruce, and 6,989,800 cubic meters of birch. The volume increment percentage was found to be 3.25 for all coniferous trees; for trees having a diameter of 10 centimeters or more it was 2.86 for conifers and 3.33 for broad-leaved species.

In preparation for the Swedish national forest survey a test survey covering the whole Province of Värmland was made in 1911. The delay in beginning the survey on a large scale was due to the war. The committee under which the work was carried out is headed by Henrik Hesselman, head of the Government forest research bureau. Other members are Josef Östlind, a director of the Government pension bureau; Tor Jonson, president of the Royal Forestry College in Stockholm; and W. Ekman, president of the Korsnäs Lumber and Pulp Mill.

The sample areas surveyed were parallel strips 33 feet wide. In northern Sweden the strips were from 6.2 to 12.4 miles apart; in the central and southern Provinces the interval varied from 0.6 to 3.1 miles. The survey lines were for the most part drawn at right angles to the main topographical direction, which resulted in their running in a southwest to northeast direction in the northern part of the country and in an east-west direction in the central and southern parts. During each of the summers of 1923-1929 a force averaging more than 100 men was in the field, working in crews of 8 or 10 with a forest engineer at the head of each crew. Field work occupied a total of 31 months. The field parties surveyed 32,300 miles and examined more than 180,000 test trees. Calculations made to ascertain the reliability of the sample method adopted in the survey justify the claim that the results for the entire country in regard both to area of productive forest land and to cubic volume and increment do not diverge more than 2 per cent from the results that would have been obtained had the entire country been covered with survey strips 33 feet wide and the same methods of procedure used.

Government-owned forests make up 16 per cent of the total in Sweden; 6 per cent of the total forest area is in other types of public ownership, and 29 per cent is owned by private companies. Forest products represent half the nation's annual income from exports.

Reforestation in the "Zone Rouge" of the Meuse

Reforestation of war-devastated land in the Department of the Meuse, France, was begun on a large scale in 1929 as a project of the national administration of forests and waters. A law of 1919 had provided for Government acquisition of such war-devastated lands as could not be restored at an expense justified by their prospective value following restoration. Under a law of 1923, such parts of the "zone rouge" as were still susceptible of agricultural use were portioned off and placed on sale, and the remainder was incorporated into the public domain to be improved by reforestation. The lands thus turned over to the control of the administration of forests and waters amount to 13,582 hectares and are situated in 41 communes. The two units of greatest importance are those of Morthomme and Verdun, containing 3,103 hectares and 9,270 hectares, respectively.

These two units have been divided into 17 large sections bounded by highways or railroads; these sections, in turn, have been cut into 637 blocks containing an average of 20 hectares each, bounded by 476 kilometers of firebreaks, lanes, and paths. As a rule the firebreaks are 10 meters wide and the lanes and paths 6 meters and 3 meters wide, respectively. Identifying numbers have been given to the small units of land.

The only restorative work done on the soil is a rough leveling of the lanes and paths. Road building has been preceded by the clearing away of wires and explosives. The cost of the leveling and preparation of the lanes and paths in 1929 and 1930 was 50 francs per hectare. Military roads have been utilized wherever possible.

The area to be forested includes 8,789 hectares of land not forested prior to the war; 3,414 hectares of land on which there exists some timber or some reproduction of willow, hazel, or various worthless species; and 171 hectares of land occupied by marshes antedating the war or resulting from it. Nearly everywhere the compact calcareous clay has been deeply disturbed. The terrain is rough, with abrupt slopes. Altitude varies from 200 to 388 meters.

On land not wooded before the war, both sowing and planting have been practiced. Seed spots one-half meter square spaced 2 meters apart each way have been cultivated to a depth of from 20 to 25 centimeters. The spring following their preparation these spots were sown with Austrian pine and Scotch pine alternating in rows, 2 kilograms of Austrian and 1.5 kilograms of Scotch pine seed being used on each hectare. Three years after the sowing, some of the seedlings are to be lifted and transplanted between the rows. This system is favored as making it possible to utilize labor during the summer and as modifying risks: in 1929 the catch of the seed spots was 90 per

cent, whereas that of the plantations was only 50 per cent. In establishing plantations, 4,444 plants have been used per hectare, with a spacing of $1\frac{1}{2}$ meter by $1\frac{1}{2}$ meter. In general the plan has been to use a costly coniferous species in part and to fill in with a broad-leaved species of less value. Austrian pine has been mixed with alder or birch on dry land or on southern exposures; spruce, Douglas fir, or Japanese larch has been mixed with ash, sycamore, or acacia on cooler land or land having a northern exposure. On land partially wooded or bearing a stand of reproduction Austrian pine or acacia has been used on southern slopes, and on other exposures silver fir has been used in the proportion of 500 plants per hectare. Silver fir is used, likewise, in seed spots under reproduction. On swampy terrain use is made of 2-year poplar cuttings 2 to $2\frac{1}{2}$ meters in height and spaced 5 or 6 meters apart each way.

In the work executed by the administration itself, manual labor is obtained locally by advertisement, women being employed whenever possible. The concern to which a contract was awarded for a large part of the work recruits its workers in the poor sections. Barracks for workers have been erected close to the lands to be reforested.

The work has kept pace with the program decided upon in advance and sometimes has outstripped it. Barring exceptionally unfavorable weather conditions it is expected that the project will be completed in 1934.

Douglas Firs in Belgium Make Good Growth and Produce Excellent Seed

Foresters who attended the congress of silviculture held in Antwerp in 1930 and subsequently participated in a tour of Belgian forests were particularly struck by the good growth of Douglas fir in the arboretum of the Forest of Cédroigne, writes L. Pardé in the *Revue des Eaux et Forêts*. On one plot of Douglas fir planted in pure stand in 1902, the cubic content of 25 individual trees totaled 11 cubic meters in 1930. The average tree measured 13 meters in height and 86 centimeters in circumference. On another plot where Douglas fir had been planted in 1902 in mixture with spruce, 42 Douglas firs were found in 1930 to have a content of 17.145 cubic meters and 33 spruces represented a volume of 3.911 cubic meters; the average tree, for the Douglas firs, was 14 meters in height, 0.8 meter in circumference, and 0.408 cubic meter in volume; the spruces averaged 8 meters in height, 0.5 meter in circumference, and 0.118 cubic meter in volume. The figures for the second plot represent a volume per hectare, at the age of 28 years, of 331 cubic meters, including 270 cubic meters of Douglas fir and 61 cubic meters of spruce.

At the Forest of Cédroigne there have been harvested 2,700 kilograms of cones of Douglas fir which have

produced 27 kilograms of seed. The expense of gathering the seed was 1 franc 30 centimes per kilogram. The seed showed a germination percentage of 85.

The Forest of Cédrogne is situated on a gentle slope with a south-southwest exposure, at an altitude varying from 485 to 605 meters. Frosts occur from the last of September till June. Snow is abundant, and annual rainfall averages 1,200 millimeters. The soil is of good quality.

At Saint-Jean, the estate of the late Count Adolphe de Limburg-Stirum, once president of the Société Centrale Forestière de Belgique, the visitors saw a stand of Japanese larch, established in 1905, of which six individuals measured from 78 to 95 centimeters in circumference at breast height in 1930.

Government Control of Forests in Portugal Extends to Private Land

In Portugal the Government controls forest management on communal land and also on private land within areas the reforestation of which is declared to be a public benefit. Private owners of land not included in such areas who wish to reforest their land or to manage it for sustained yield may choose to have their operations supervised by the Government. Communal lands under the management of Government foresters total about 48,164 hectares; private lands on which forestry management is supervised by the Government aggregate 196,384 hectares.

Communal forests of great extent and great value are said to have existed in Portugal in the past on land now deforested and used only for pasture. At such a rate as its resources and personnel permit the national forest service is undertaking the reforestation of denuded communal lands entirely at Government expense, guaranteeing to the communes that in the future revenue will be proportional to expense and to the estimated value of the land. While the improvement of such land is in process the Government engages to pay into the communal treasury an annuity corresponding to the average revenue from the land during the 10 years preceding the initiation of the forestry work. This annuity usually amounts to very little or to nothing at all, since most of the communes exercise no proprietary rights over their waste land.

In the case of lands placed under the management of the forest service at the owner's volition, the task of the forest service is merely to see that the owner adheres to a plan of management to which he has agreed.

Portugal's forest resources are still sufficiently extensive that the nation exports greater quantities of wood products than it imports. Forest stands occupy 22 per cent of the country's total area. Nevertheless, according to the estimate of Director General

of Forests Borges, reforestation is needed on nearly 30,000 hectares of dune land and 1,200,000 hectares of mountain land.

Excellent results have been obtained on 20 areas where reforestation work has been initiated by the Government since 1901. Recent action of the Legislature of Portugal provides for extension of this work.

Distribution of Trees in Victoria

Discussing the subject "The factors controlling the distribution of trees in Victoria" before the Royal Society of Victoria, Australia, in December, 1929, Reuben T. Patton spoke in part as follows:

Some trees, as, for instance, *Eucalyptus globulus*, do not seem to follow any law as regards distribution. The same applies to the snow gum, *E. coriacea*. The latter has the capacity to withstand the cold and depth of winter snows at a little below 6,000 feet elevation and is the only tree species that can. We find this species, however, on the undulating Silurian country at Yering and on the Tertiary formation at Dandenong, only a little above sea level. It occurs on the dry Silurian shales at Eltham, but it does not occur on the mountains to the northeast about Healesville. Very similar is the distribution of *E. globulus*. It occurs on the cool seaward face of the cliffs at Kalimna and comes down almost to the edge of the water. It is found on the dry northern slopes of the granite hills at Trawool, and, as a striking contrast to this, it occurs abundantly in the Otway Forest. These habitats do not appear to be related in any way. Such examples of distribution are unexplainable except on the assumption that these species are not specialized as regards habitat and will develop anywhere provided they are not crowded out by the local vegetation. Each of the areas where these two species are found, apart from the alpine home of *E. coriacea*, are typically habitats of other species or groups of species. The distribution of species of *Eucalyptus*, then, as well as species of other genera, shows that they * * * are in equilibrium with their environment. In other words, a climax condition exists, and therefore it follows that these areas have not been recently, or comparatively recently, subject to disturbing influences. Yet it is held by many, who have only a superficial knowledge, that fire has been an active agent in distribution and that the present associations are in a large measure the result of fire. If fire had been as intensive in its destructive power in the past as it has been since the advent of the white man we would surely find evidence of active succession. * * * It is maintained by supporters of the fire theory that evidence of adaptation is to be found in the protective defence of the rough, thick bark of the various eucalypts. Unfortunately for this theory, the thickest and most protective barks, e. g., *E. sideroxylon*, occur in areas where fires are infrequent and of no consequence.

* * * In the secluded gullies * * * the presence of large trees of such a sensitive species as *Nothofagus cunninghamii* is surely evidence of the absence of fires over long periods of time. The large root burls of the musk tree, *Olearia argophylla*, are indicative of extreme age. The common dogbush, *Cassinia aculeata*, is most frequently seen as a shrub, but in gullies where fire has been absent since the advent of the white man it may be found as a small tree, and even colonies of it are to be seen. All of these trees are readily destroyed by fire and their presence as large

trees is evidence that fire has been absent. * * * Since the advent of the white man, firing of the forest has shown that ultimately the forest area will be reduced to bracken fern. There is a retrogressive succession. The change may be rapid or it may be slow, and in the succession other plants, as *Cassinia aculeata*, may obtrude themselves; but ultimately the end point is the same, bracken fern. This plant exists spasmodically in the forest area. It can not succeed where forests occur since it is strongly light-demanding. Its rhizome is unaffected by fire and in the regrowth after the fire the bracken fern rapidly makes its appearance. Its subsequent growth is largely a matter of how much of the crown canopy of the forest has been destroyed. Repeated firings open up the crown canopy more and more, thus giving the fern the necessary light. The large stores of food material in the rhizome give the bracken a great advantage over plants which have to arise from seed. The latter are ultimately choked out when bracken is dense. When the white man first arrived the wide areas of bracken now seen did not exist, nor were there extensive areas of dead timber. Fire is steadily changing the face of the forested areas.

Quebec Forest Protective Associations Report Slight Losses in 1930

The Laurentian Forest Protective Association, Quebec, patrolling 7,750,151 acres of land in 1930, had only 29 acres burned over during the year. Fires numbered 17. The first fire occurred on May 9, the last on October 15. The only other months for which fires were reported were June and August. Fire-fighting costs for the year were \$461.48, of which \$190.18 was borne by the association members and the remainder by the Government.

The association's permanent field staff was composed during 1930 of 3 chief inspectors, 1 general inspector, 18 divisional and assistant inspectors, 52 tower observers, 80 patrolmen, 114 auxiliary fire rangers, 4 central telephone operators, 5 radio telephone operators, and 27 special permit issuing officers.

Patrol of the Canadian National Railway's right of way between Riviere-a-Pierre and Hervey Junction was carried out by the association under contract, a power speeder being operated between these points at a cost to the railway company of \$650. A fire-fighting tank car with 3,000-gallon capacity, equipped with hose and tools, was placed at Lake Edward, in the center of the association's territory. In the eastern section a patrol boat was operated between Quebec and Seven Islands from June 3 to November 1.

Four new towers were built on the protective area during the year. The association's wireless telephone system was extended, stations being established at the Curtiss Reid hydroplane base at St. Felicien and at two observation towers.

Four primary weather stations were maintained, from which a complete record of data was telegraphed to Toronto daily.

The rate of assessment for the year averaged about 0.016 cents per acre.

The St. Maurice Forest Protective Association, of Three Rivers, Quebec, reports that 48 fires occurred in 1930 on the 8,910,380 acres of land which it patrolled. This is the largest number of fires reported by the association since 1923. The acreage burned over, however, was small; 25 of the fires burned over less than 1 acre and only 2 burned over more than 100 acres. Travelers, hunters, and fishermen were held responsible for 15 fires; forest workers, for 7; and railways, for 4. Lightning was reported to have caused 7 fires, or 12 per cent of the total. Fires occurred in each month of the period April-October, inclusive. The total rate of assessment levied on the 14 members of the association during the year was 1½ cents per acre.

During the most dangerous period there were 270 regular rangers on the association pay roll; auxiliary rangers totaled 230. Three new 80-foot towers were constructed, and four towers were raised in height from 60 to 80 feet. Telephone lines constructed during the year at association expense totaled 70 miles. Rangers remaining on duty after the spring fire season cleaned 939 miles of old trails and cut 38¼ miles of new trails.

As usual, the association maintained the Dominion meteorological bureau forecasting station at Manouan in cooperation with the Quebec Forest Industries Association.

Cooperative Reforestation in Ontario

Eleven county forests of 1,000 acres or more each have been established in Ontario under the Province's cooperative plan. Dufferin, Norfolk, Ontario, Victoria, Prescott and Russell, and York Counties have one such forest each, and Simcoe, Northumberland, and Durham Counties have two each. The provincial government's offer to counties is that it will plant and manage for 30 years tracts of 1,000 acres or more of suitable land purchased by counties for reforestation. At the end of that period the county may choose either to resume control of the property, paying to the Province without interest the amount that has been spent on planting and management; to relinquish claim to the property and receive the purchase price from the Province, without interest; or to share equally with the Province in the forest's management costs and earnings.

More than 80 municipal forestry demonstrations have been established under the Ontario Government's offer to supply and plant trees free of charge on small pieces of land suited for forestry demonstrations and made available for that purpose by municipalities.

Crown lands which Ontario is reforesting include a sand-dune area of 500 acres in Prince Edward County, about 10 miles from the town of Picton. This consists in a finger-shaped peninsula extending for 5 miles between Lake Ontario and West Lake. The base of the peninsula is about three-quarters of a mile wide and borders on forested and farming land. The north-west wind sweeping across Lake Ontario strikes one section of this area, and for many years the sand has

been slowly encroaching on valuable timberland and good agricultural soil. It is estimated that since this part of the Province was first surveyed, in 1852, 85 acres of farm land alone has been covered or spoiled by the drifting sand. Plots of Crown land in northern Ontario are being planted for demonstration purposes. In addition the provincial forestry organization has planted large areas such as the Kirkwood "desert" north of Thessalon. In 1930 this type of work was extended and more than 3,000,000 trees were set out in the northern forest districts.

Provincial nurseries in which forest planting stock is grown from seed are located near St. Williams, in Norfolk County, on the north shore of Lake Erie; at Orono, in Durham County; and at Midhurst, in Simcoe County. A transplant nursery is maintained at the Sand Banks, in Prince Edward County. In 1930 the trees distributed from these nurseries totaled more than 10,000,000. In that year trees were supplied to 6,000 persons. Most of the trees were distributed free, the recipients paying express charges. For reforestation purposes any resident of the Province is allowed 3,500 trees a year free and may obtain additional quantities at \$4 per 1,000. For windbreak planting 500 spruce and cedar are supplied free to any resident.

At each of the three nurseries where stock is grown from seed, forest plantings have been made for demonstration purposes. In some of these, particularly at

the St. Williams nursery, which was established in 1905, the trees are now 30 feet and more in height.

For some years it has been the policy of the Ontario Department of Forestry to gather all the tree seed it requires for reforestation work. All seed is gathered on a piece-work basis. During the past two years alone there have been harvested for the use of the Province more than 17,000 bushels of Norway pine cones, 6,000 bushels of northern white pine cones, 1,500 bushels of jack pine cones, 4,000 bushels of white spruce cones, 1,200 bushels of walnuts, and smaller quantities of cones of Scotch pine, cedar, and hemlock, butternuts, and seed of ash, maple, elm, cherry, birch, and oak. The Province maintains at Angus an extracting plant with drying sheds having a storage and drying capacity of 50,000 bushels of cones. The extracting chamber is capable of holding 300 bushels of cones at a time.



M. Tanasesco-Mosandrei, late inspector general of forests of Rumania, bequeathed 1,050,000 lei to the forestry society Progresul Silvii, Bucharest, as a scholarship fund for Rumanian students in the École des Eaux et Forêts of Nancy, France, of which he was an alumnus. The scholarship is to be awarded to a forestry student of the École Polytechnique of Bucharest on the basis of the results of a competitive examination held in the French language.

Personals

E. F. McCarthy, director of the Central States Forest Experiment Station, has been chosen to succeed the late John W. Stephen as head of the department of silviculture, New York State College of Forestry. Mr. McCarthy previously taught in the college for a period of nine years. He served for six years as a silviculturist at the Appalachian Forest Experiment Station and has been director of the Central States station since it was first established in 1927.

W. R. Hine has resigned as executive secretary of the Society of American Foresters, because of illness. He is succeeded by Franklin W. Reed, who leaves a position as industrial forester for the National Lumber Manufacturers Association. Mr. Reed's career in forestry, for which he was trained at the Biltmore Forest School, includes long experience in the Government service. He held a series of administrative positions in the United States Forest Service, including those of associate district forester in the Intermountain Region and district forester in the Eastern Region. Before entering the employ of the National Lumber Manufacturers Association in 1928 he engaged for some time in private consulting forestry work.

M. B. Pratt has been reappointed State forester of California, after three terms in that office.

M. J. Fox, of Iron Mountain, and Philip K. Fletcher, of Alpena, have been appointed to succeed E. C. Voght and Lee J. Smits as members of the Michigan Conservation Commission.

Conrad L. Wirth has been appointed assistant director of the National Park Service in charge of the branch of lands, succeeding the late W. B. Lewis.

Herbert S. Jackson has resigned as head of the department of botany in the Purdue Agricultural Experiment Station to accept the position of professor of mycology and cryptogamic botany in the University of Toronto.

Herbert S. Gilman, of Los Angeles, R. C. Harbison, of San Bernardino, Swift Berry, of Camino, E. Walton Hedges, of San Juan, and B. A. McAllaster, of San Francisco, have been appointed to the California State Board of Forestry. Charles S. Howard, of San Mateo, and Mr. McAllaster have been elected chairman and vice chairman, respectively. The seventh member of the board is Ernest G. Dudley, of Exeter.

DuPre Barrett, for some time in charge of the forestry work of the Georgia State College of Agriculture, is now extension forester for the college, collaborating with Extension Forester K. S. Trowbridge.

Fellowships for advanced training in forestry during the coming year have been awarded by the Charles Lathrop Pack Forest Education Board to seven foresters, including six Americans and one Canadian. The successful candidates, their status at the time of the awards, and their plans for the year are as follows: Ralph Caird, graduate student University of Michigan, to continue investigations in normal and pathological tree physiology and to continue general study of forestry begun under Charles Lathrop Pack fellowship awarded in 1930; John Broughton Fortin, senior New York State College of Forestry, graduate work in silviculture; Bernard Frank, graduate student University of Wisconsin, to continue study and research in land utilization begun under Charles Lathrop Pack fellowship awarded in 1930, with special emphasis on land-classification methods and tax-delinquent lands, together with advanced studies in economics and statistics; Frank Avery Ineson, student Forest Academy, Hann. Münden, Germany, nine months' graduate study at the School of Forestry and Conservation, University of Michigan, in forest management and utilization; Harold John Lutz, assistant professor of forestry Pennsylvania State College, to make an ecological study of the plains areas in southern New Jersey in partial fulfillment of requirements for the Ph. D. degree from the Yale School of Forestry; Willis Westlake Wagener, forest pathologist, United States Department of Agriculture, San Francisco, Calif., to do advanced research in forest pathology in partial fulfillment of requirements for the Ph. D. degree from the Yale School of Forestry; Horace Peterson Webb, consulting forest engineer, Loggieville, New Brunswick, Canada, to make an investigation of seasonal versus year-round logging in the pulp and paper industry of eastern Canada.

E. M. C. Eddy, formerly an employee of a fuse company, has been brought into the Connecticut State forestry organization to instruct local wardens in fire-protection methods and to take charge of suppressing large fires in the portion of the State west of the Connecticut River. Mr. Eddy has had about 20 years' experience in fighting fire. While with the fuse company he was responsible for the protection from fire of woods in which large quantities of explosives were stored at all times.

Mark M. Lehrbas has joined the staff of the Southern Forest Experiment Station, for work in connection with the national survey of forest resources. Mr. Lehrbas joined the United States Forest Service in January, 1928, and since that time has been engaged in appraisal of timber and lands in the Eastern Region.

John McLaren, fire-control inspector of the United States Forest Service, has accepted a transfer from the Northern Region, with headquarters at Missoula, Mont., to the Lake States Region. There he will be engaged primarily in land-acquisition work.

J. A. Putnam has joined the staff of the Southern Forest Experiment Station and has been assigned to the hardwood survey. Mr. Putnam was attached to the station in 1928 and assisted at that time in a survey of the bottom-land hardwoods of Louisiana. In the interim he has had two years of practical woods work as forester for the Thistlethwaite Lumber Co., Opelousas, La.

Charles A. Connaughton has been transferred from the Boise National Forest, Idaho, to the Intermountain Forest and Range Experiment Station, Ogden, Utah. He will assist in forest management research dealing primarily with methods of cutting and with natural reproduction of western yellow pine.

Ray F. Bower has joined the faculty of the New York State College of Forestry, and has been assigned to the extension department. Since receiving the B. S. degree in forestry from the Michigan State College in 1929 Mr. Bower has been employed as assistant in the division of forestry of the Ohio Agricultural Experiment Station.

C. L. Perkins has resigned as supervisor of the Monongahela National Forest, W. Va., and is now forester on a privately owned estate of 10,000 acres near Ligonier, Pa. Arthur A. Wood is being transferred from the supervisorship of the Nantahala National Forest, N. C., to that of the Monongahela. John Byrne, assistant supervisor of the Pisgah National Forest, N. C., has been designated to succeed Mr. Wood. William P. Kramer, for 10 years supervisor of the Luquillo National Forest, Porto Rico, and insular forester for Porto Rico, will take the position vacated by Mr. Byrne. William R. Barbour, now forester in the Virgin Islands, will succeed Mr. Kramer. Eugene V. Roberts is to be transferred from the Choctawhatchee National Forest, Fla., to take charge of forestry work in the Virgin Islands.

John F. Campbell is being promoted from the position of assistant supervisor of the Deschutes National Forest, Oreg., to that of supervisor of the Fremont National Forest, Oreg. Gilbert D. Brown, whom he succeeds, is taking over the supervisorship of the Wenatchee National Forest, Wash., on the retirement of A. H. Sylvester.

H. D. Story and H. G. Wallace have been made district foresters in the Georgia Forest Service. Mr. Story, who is a forestry graduate of the Louisiana State College and has been employed in Georgia in connection with the southern forestry educational project of the American Forestry Association and co-operators, is stationed at Albany, with headquarters at the Gordon Hotel. Mr. Wallace, a forestry graduate of the Georgia State College of Agriculture, is stationed at Columbus, with headquarters at the chamber of commerce rooms.

Members recently appointed by the Secretary of Agriculture to the regional forest research advisory councils are the following: Appalachian, Chapin Jones, State forester of Virginia; J. S. Holmes, State forester of North Carolina; J. O. Hazard, State forester of Tennessee; H. S. Newins, State forester of West Virginia; H. A. Smith, State forester of South Carolina; Thomas P. Cooper, director, Kentucky Agricultural Experiment Station; Julian A. Burruss, president, Virginia Polytechnic Institute; William J. Hutchins, president, Berea College; Reuben B. Robertson, president, Champion Fibre Co., Canton, N. C.; Paul R. Camp, vice president, Camp Manufacturing Co., Franklin, Va.; John Raine, president, Meadow River Lumber Co., Rainelle, W. Va.; Thomas H. Claggett, chief engineer, Pocahontas Coal & Coke Co., Bluefield, W. Va.; S. F. Horn, editor, the Southern Lumberman, Nashville, Tenn.; W. D. Tyler, vice president, Clinchfield Coal Corp., Dante, Va.; Joseph Hyde Pratt, consulting engineer, Chapel Hill, N. C.; Verne Rhoades, consulting forester, Asheville, N. C.; Central States, J. H. Skinner, director, Purdue University Agricultural Experiment Station; William Trelease, professor emeritus of botany, University of Illinois; Thomas L. Wheeler, editor, Indiana Farmers' Guide, Huntington, Ind.; Charles F. Huhlein, Louisville, Ky.: Northeastern, George T. Carlisle, consulting forester, Bangor, Me.; N. L. Violette, forest commissioner of Maine; P. H. Merrill, State forester of Vermont; W. G. Howard, superintendent of lands and forests of New York; W. A. L. Bazeley, State forester of Massachusetts;

R. S. Hosmer, New York State College of Agriculture; Hugh P. Baker, New York State College of Forestry; E. H. Thompson, president, Federal Land Bank, Springfield, Mass.; R. W. Thatcher, president, Massachusetts Agricultural College; J. C. Kendall, director, New Hampshire Agricultural Experiment Station; Harry R. Lewis, commissioner of agriculture of Massachusetts; A. F. Hawes, State forester of Connecticut; California, Robert G. Sproul, president, University of California; E. E. Brownell, director, California Woolgrowers' Association; Francis Cuttle, Tri-Counties Reforestation Committee; Charles G. Dunwoody, director, conservation department, California State Chamber of Commerce; H. S. Gilman, president, Angeles Forest Protective Association; Duncan McDuffie, State Parks Council; H. M. Robinson, president, Los Angeles First National Trust and Savings Bank; Willis Walker, vice president, Red River Lumber Co., San Francisco; Allegheny, Edmund O. Ehrhart, forester, Castanea Paper Co., Johnsonburg, Pa.

William P. Apgar has been named as director of the Savenac Nursery of the United States Forest Service, at Haugan, Mont., succeeding G. Willard Jones, who has been transferred to the Lake States Region to establish a nursery at Rhinelander, Wis. Mr. Apgar comes from Halsey, Nebr., where he has served as director of the Bessey Nursery of the Forest Service.

Floyd W. Godden, junior forester on the Salmon National Forest, Idaho, has been promoted to an assistant supervisorship on the Idaho National Forest.

Bibliography

Run-off and Erosion on Utah Watersheds Greatly Influenced by Density of Herbaceous Cover

By R. S. CAMPBELL, United States Forest Service

The second large-scale study of run-off and erosion that has been made in this country is reported in a recent bulletin² by C. L. Forsling, director of the Intermountain Forest and Range Experiment Station, Ogden, Utah. The first such study was conducted by the Federal Forest Service and Weather Bureau over a period of 19 years at Wagon Wheel Gap, Colo. Whereas the Wagon Wheel Gap study was designed to bring out the results of gradual depletion of forest cover by cutting, the study reported by Mr. Forsling had to do with watersheds devoid of timber and was

intended to bring out the rôle of herbaceous and shrubby vegetation in controlling run-off and erosion, particularly as affected by grazing. The findings are of vital interest to range livestock owners, irrigation farmers, other water users, and conservationists in general.

The study was made on two adjacent small but complete watersheds in Ephraim Canyon, on the Wasatch Plateau, Utah. Watershed A, containing 11.244 acres, was used as a variable. Watershed B, containing 8.972 acres, served as a constant. Equipment was installed to measure precipitation, run-off, and sediment removal.

The vegetation on watershed A constituted 16 per cent of a complete cover at the outset of the study, in 1915, having been heavily depleted by overgrazing. It was grazed closely enough to limit it to 16 per cent of a complete cover through 1919; from 1920 until 1924 it was not grazed and the density of its vegetation was increased, by natural and artificial reseeding, from 16 per cent to 40 per cent; from 1925 to 1929 it was moderately grazed each year, except in 1926, and was

² A Study of the Influence of Herbaceous Plant Cover on Surface Run-off and Soil Erosion in Relation to Grazing on the Wasatch Plateau in Utah. Technical Bulletin 220. Copies may be obtained free of charge, as long as the supply lasts, from the Office of Information, U. S. Department of Agriculture, Washington, D. C.

maintained at 40 per cent of a complete cover. The vegetation on watershed B was grazed each year throughout the experiment and was maintained at 40 per cent of a complete cover.

Precipitation on the study areas averaged 29.51 inches per year. Each year two fairly distinct periods of surface run-off occurred: The season of melting snows, during May and June, and that of summer rains, during July, August, and September. The mean seasonal precipitation during the July-September period was 4.99 inches, or 16.9 per cent of the average annual precipitation. Soil moisture studies indicated that the summer rains failed to penetrate deeply and that water from melted snow was the only moisture which contributed to the underground supply. When watershed A had a 16 per cent cover of vegetation summer rain storms produced 4.6 per cent of the average annual surface run-off; but this small run-off caused 84.5 per cent of the erosion. When the area had a 40 per cent cover summer rains produced only 1.3 per cent of the annual run-off, but run-off from summer rains caused 65.8 per cent of the erosion. The quantity of sediment eroded by run-off from summer rains varied more or less directly with the quantity of run-off but was influenced to some extent by the rate of run-off, the trampling of livestock, and the moisture content of the soil when a storm sufficient to cause run-off occurred. Some of the soils were granular and were eroded easily when they were dry but not so easily when they were wet.

Because rainfall was less in the 1924-1929 period than in the 1915-1920 period, no satisfactory conclusions could be arrived at by comparing records for the two periods. Comparison of the run-off and erosion records for watershed A with those for watershed B indicated that surface run-off from rainfall was 64 per cent less, and erosion resulting from this run-off 54 per cent less, on the area with a 40 per cent complete herbaceous cover than on that with a 16 per cent cover. Greater density of cover did not affect the quantity of run-off from melted snow; consequently the net difference in average annual surface run-off was only 3.3 per cent. Erosion from melted snow, however, was 57 per cent less on the watershed with a comparatively dense herbaceous cover than on the depleted watershed. In commenting on his conclusions Mr. Forsling writes:

Vegetation aided in checking erosion in the following ways: By obstructing the rain where it fell and keeping the run-off spread out and reducing its rate of flow, thereby reducing sheet erosion, the establishment of shoestring gullies, and cutting along the sides and bottoms of the larger gullies; by binding the soil against erosion; by catching or straining out of the water much of the sediment being carried by run-off; and by reducing creep into the gullies of the loose soil on steeper slopes. The replacement of species with inferior root systems by plants with more extensive fibrous roots helped further to improve the absorptive capacity of the soil and bind it against erosion. The establishment of plants in the gullies aided further by

damming and clogging the gullies, thus checking the velocity of the flow and reducing the carrying and abrasive power of the water and causing soil and debris to be deposited in them. Many of the smaller gullies which originally were steep sided are gradually being filled in and shallowed out.

Observations on land of similar character on which the herbaceous cover was not depleted indicate that 60 per cent of a complete cover is the maximum obtainable on watershed A.

The results of this study indicate that a normal cover of herbaceous vegetation, although probably not adequate to prevent flash summer floods, to a considerable degree does abate torrential run-off and reduce floods from sudden heavy rainstorms in mountainous regions.

Range management that will restore and maintain the maximum plant cover for grazing purposes will also assure satisfactory watershed protection except in extreme cases, Mr. Forsling concludes. For mountain watersheds in general, the most promising method of reestablishing plant cover is natural revegetation, brought about by allowing native plants to mature and disseminate their seed or revegetate in other ways. Where the cover has been badly depleted and the better surface soil washed away, where soil conditions are unfavorable, or on very steep slopes, in order to obtain natural revegetation it may be necessary to restrict forage utilization to very light grazing or to moderate autumn grazing after plant maturity, or even to exclude stock entirely. On overgrazed western mountain lands where growing conditions are favorable artificial reseeding will hasten revegetation and the control of erosion.

Growing Trees for Forest Planting in Montana and Idaho

By C. F. KORSTIAN, Duke University

A circular destined to take its place in forestation literature as a standard reference is *Growing Trees for Forest Planting in Montana and Idaho*,³ by D. S. Olson. In this 91-page publication Olson discusses the selection and development of a nursery site, soil management, and the storage of tree seed, giving examples drawn from the practice at the Savenac Nursery of the United States Forest Service at Haugan, Mont. He discusses in detail the propagation, care, and distribution of coniferous planting stock produced at Savenac, the common injuries to the stock, and methods of preventing these injuries. No one is better fitted to write such a monograph on the Savenac Nursery than Olson, who has been long and intimately connected with the nursery and has himself developed, or at least improved, most of the implements and methods in use there.

In the preface the author very aptly states that the "methods that have been developed for this particu-

³ U. S. Department of Agriculture Circular 120. Copies may be obtained free of charge, as long as the supply lasts, from the Office of Information, U. S. Department of Agriculture, Washington, D. C.

lar nursery may not be directly applicable to all nurseries, because of differences in climate, soil, and number or kind of trees raised. However, they may be used in part or adapted to fit conditions at other nurseries." They may also suggest modifications in methods used elsewhere. Throughout the circular emphasis has been given to the necessity for thoroughly testing new methods and technique under the conditions peculiar to each nursery and locality before making extensive use of them as part of the standard practice.

One of the outstanding features of the circular is the description of implements specially devised for nursery work and of agricultural implements adapted, with or without modification, for use in the various nursery operations in order to lessen the requirement of manual labor and thus reduce the cost of growing seedlings and transplants. Along with the effort to reduce the cost of producing stock an equally strong effort has been made to obtain high survival. Especially important implements are the sand spreader (which is based on the general principle of the ordinary manure spreader), the horsedrawn tree pruners, and tree lifters.

The method of packing trees for shipment in burlap rolls, which was developed by Olson at the Savenac Nursery and is used extensively in the West, is described in detail. The extent to which the development of apparatus has gone is indicated by the seed sampler and seed-measuring can. The latter has an adjustable sleeve so that it can be set to hold different quantities of seed, according to the quantity the nurseryman desires to sow in each bed.

The cost of transplanting at the Savenac Nursery has been so reduced by the improved methods developed there that in Olson's opinion the expense of obtaining high-grade stock is unquestionably within justifiable limits. The method most commonly used is to set the seedlings in long furrows opened by a specially-developed plow. The transplant board used, a modification of the Yale board, is 8½ feet long. With a spacing of 1½ inches between each two notches, it holds 75 trees. This was determined by stop-watch studies as the number of trees that could, by fast work, be placed in a board by one man of the crew in the length of time required by the other man to plant a boardful. To make this scheme effective it is necessary, of course, to group the workers in crews according to their individual rates of speed.

Another noteworthy feature of the work at the Savenac Nursery is the effort to eradicate weeds with chemicals. After summarizing the experiments described in detail by Wahlenberg ⁴ and after describing the method of using zinc sulphate solution, the chemical which has given the best results, Olson states that great caution should be observed in chemical weeding because

after repeated applications the soil may become toxic to the trees. Direct toxic action by zinc ions is distinctly to be feared. Chemical treatment is not practiced at the Savenac Nursery when the weeding is only a small problem. In Olson's opinion this treatment is of most value where it can be used to clean up areas badly overgrown with weeds.

It seems to me that the author has made the formula for the quantity of seed to sow unnecessarily complicated-looking. It might be expressed more simply in words as follows:

Pounds of seed required = $\frac{\text{Number of trees desired on area}}{\text{Number of germinable seed per pound.}}$

Because of its readability, general excellence, and usefulness the circular should be read and used by all nurserymen, forest planting specialists, and teachers of forest seeding and planting.

Wood-Using Industries of Virginia

By W. D. BRUSH, United States Forest Service

Because of the increasing interest in timber requirements and the use of wood, a publication of the Virginia Polytechnic Institute on Wood-Using Industries of Virginia calls for special comment. This publication covers the year 1928 and was prepared by J. Elton Lodewick, professor of wood technology. It is similar in scope to one prepared in the United States Forest Service for the year 1911 and published by Virginia in 1912.

Part I of the bulletin gives a brief description of the forests of Virginia by regions and by four "main forest types," together with a list of trees of the State. Part II gives for each wood a general discussion of properties and uses and a table of quantities used, by industries. Part III discusses each of the wood-using industries of the State and gives a table for each industry showing quantities of wood used, by kinds. Part IV is a directory of wood-using firms by counties and by industries. Part V is a tabulation of the uses of each wood in the State.

The statistical tables given for each kind of wood show in addition to quantities used in 1911 and 1928 in each industry the average cost at the factory and the percentage grown in the State in each of the two years. The tables for each industry show also for the two years the average cost of each kind of wood at the factory. With a few exceptions, the quantities grown in the State are given for 1928; these quantities are not given for 1911.

No compilation is shown of total quantities of wood grown in the State. While this would evidently have involved some estimating, the resultant data might have shown with sufficient accuracy an interesting comparison between 1911 and 1928 as to the State's increasing or decreasing dependency on outside sources.

In addition to the secondary industries commonly included in State wood-using reports, the 1928 report

⁴ Wahlenberg, W. G. Investigations in Weed Control by Zinc Sulphate and other Chemicals at the Savenac Nursery. U. S. Department of Agriculture Technical Bulletin 156. 36 pp. 1930.

includes the following primary industries: Tanning extract, pulp, cooperage stock, veneer, and excelsior. Of these industries excelsior only was included in the 1911 report. Consequently the figures given on total quantities used in 1928 and 1911 are not comparable, nor are the totals by kinds of wood. In a general discussion under Part II, The Woods Used, it is stated that "482,750,000 feet were consumed by a group of industries similar to those which reported nearly twice as much in the earlier survey." (The total quantity consumed in 1928 is given as 732,546,857 feet; the corresponding figure given in the 1911 report was 894,441,902 feet.) Evidently the figure of 482,750,000 feet was arrived at by deducting only the quantities of wood used in 1928 in manufacturing tanning extract, pulp, and cooperage stock. It is not explained why the quantity used in manufacturing veneer was not also deducted. It seems not only that this item should have been deducted to make a valid comparison with 1911 but that it should have been omitted from the total given in this bulletin; it may be inferred from the text that much of this veneer must have entered into furniture and other products manufactured in the State and therefore have been added into the total twice.

Figures on lumber used in manufacture in 1928 have recently been compiled by the United States Forest Service as a part of the national survey of forest resources and wood requirements. Primary industries included in the Virginia report but not in the Forest Service compilation for 1928 are reported by the former to have consumed 285,194,696 board feet in that year. Deducting this quantity from the total quantity consumed in the State during the year as quoted by the Virginia bulletin leaves a balance of 447,352,161 board feet as compared with the Forest Service total of 477,797,000 board feet, a difference of approximately 6 per cent.

The most striking differences between quantities reported by the Forest Service in 1911 and quantities reported by the Virginia Polytechnic Institute in 1928 are as follows: Boxes and shooks declined about 60 per cent and planing-mill products about 75 per cent, while furniture increased about 400 per cent. Competition from fiber containers and other substitutes is suggested as a reason for the decrease in boxes, and the "tendency for wood fabricators to keep near lumber-producing centers" as the reason for decrease in planing-mill products.

A great decrease is shown for "yellow pine" and large increases for chestnut, red gum, and tupelo. Valid comparisons by kinds of wood can not be made from the summary table, however, because of the inclusion in the 1928 report of primary industries not included in that of 1911. "White pine" and "yellow pine" include western as well as eastern species, so that no opportunity is provided of determining to what extent the former are replacing the latter.

The average cost of all material at the factory was reported as \$29.93 per 1,000 board feet in 1928 as compared to \$15 reported for 1911.

On page 70, under a general discussion of industries, reference is made to a "200 per cent decrease in the lumber consumption," and on page 30 it is stated that "the amount used decreased nearly 100 per cent." The author doubtless intended to indicate that the decreases amounted to 200 per cent and 100 per cent, respectively, of the quantities used during the later period.

This general survey of the wood-using industries of Virginia should be of considerable value not only to the industries themselves, in helping them to improve their manufacturing practices, but also to timber owners who wish to market their products advantageously. It should stimulate local interest in the proper use of timber and also in its growth. The data have evidently been collected with care and are well presented in tabular form. The large number of appropriate illustrations and diagrams, as well as the selection of good type and high-quality paper, add much to the attractiveness of the publication.

Marketing Woodland Products in Virginia

By W. D. BRUSH, United States Forest Service

The small timber owner, especially if he is a farmer with his main interest in other crops, needs all the available information bearing on profitable outlets for his timber. State wood-using industry reports, such as the Virginia report discussed in the foregoing review, may help him to locate markets; but usually he requires more detailed information on such subjects as how to determine the value of the timber, how to prepare it for sale, and what are likely to be the most profitable markets. Such information is very admirably presented in the 69-page publication *Marketing Woodland Products in Virginia*, by J. Elton Lodewick, published by the Virginia Agricultural Experiment Station and the Virginia Polytechnic Institute.

Professor Lodewick first discusses the advantages and disadvantages of different methods of selling, describes the place of the sawmill in marketing, and gives an account of cooperative marketing procedure. Methods of determining the value of timber by estimating and scaling are briefly described.

The main portion of the bulletin consists in detailed information on each form of forest product, as logs, poles, posts, lumber, and mine timbers, that will be helpful in marketing timber in these forms in Virginia. Specifications, stumpage prices, harvesting and transportation costs, commissions, selling prices (and price trends), and lists of users are given under each of these products.

Some of the information in this bulletin, the preface states, has been adapted from other publications;

Professor Lodewick has, however, furnished a large quantity of new data that should be of inestimable value to the Virginia timber owner who wishes to convert his trees into money.

Even under the present unfavorable market conditions for forest products, this publication is of service in helping the owner to think of his woodland in terms of markets and to avoid disposing of his wood crop for less than the real value.

Fertilizer Experiments at Savenac Nursery

By L. S. GROSS, United States Forest Service

W. G. Wahlenberg presents in United States Department of Agriculture Circular No. 125⁵ the results of several years' experimentation at Savenac Nursery, Haugan, Mont., in the use of fertilizer in producing forest planting stock. Experiments carried out in the period 1921 to 1926 were aimed at determining an effective and safe method of stimulating development of the slow-growing Engelmann spruce. Work begun in 1925 had as its object the maintenance of the productivity of nursery soil. Forest nursery soil is, of course, subject to a greater drain than the soil on which most agricultural crops are produced, since the seedlings are commonly grown at densities of 100 or more to the square foot and are lifted entire together with the soil surrounding their roots.

The experiments in maintaining soil fertility were started in 1925, when intensive cropping had been practiced at Savenac Nursery for 15 years. A triangle fertilizer experiment was initiated with the establishment of 21 separate plots of 3 square feet each. Half of each plot was sown to western yellow pine and half to Engelmann spruce, uniform quantities of seed of the same lot being used on all plots of each species and treatment of all plots being identical during the year except for the application of fertilizer. The three plots at the corners of the triangle were fertilized with sodium nitrate (nitrogen), muriate of potash (potassium), and superphosphate (phosphorus), respectively. The four outside plots between each two corners were fertilized with mixtures of the two elements represented by the corner plots, the proportion of each element in the mixture varying with the distance of the plot from the corner. The six interior plots were treated with different mixtures of the three fertilizers used. Two unfertilized check plots were established near the triangle.

Engelmann spruce seedlings grown in the nursery in soil fertilized with dried blood and ground bone showed stimulation of growth as early as the second year. At the end of the third year, those heavily fertilized

weighed more than twice as much as seedlings grown without fertilizer weighed when 4 years old. Stock grown in fertilized soil and transplanted to the field as 3-0 seedlings survived field planting in a greater proportion than stock of the same age class grown in unfertilized soil. Seedlings grown on fertilized soil that were heavily watered developed faster than others but showed a tendency toward an unbalanced, top-heavy form. Heavy seed-bed watering had little effect on the height of 2-2 stock and no significant effect on the field survival of 3-0 stock. Results of a few tests indicated that sodium nitrate in solution might advantageously be used as a top dressing for 2-0 Engelmann spruce beds, in the proportion of one-half pound or one pound to 48 square feet. This treatment tends to eliminate weaker and crowded individuals and to force the growth of the better trees.

Best results with western yellow pine were obtained in the portion of the triangle nearest the nitrogen corner. The plot selected as showing the best all-round development of suitable planting stock was that fertilized with a mixture of sodium nitrate, superphosphate, and muriate of potash in the proportions of 320 pounds, 160 pounds, and 30 pounds, respectively, per acre. With an average rating of 100 assigned to the check plots on the basis of germination percentage, percentage of good stock produced, height of top, diameter of stem, oven-dry weight, relation of weight of root to weight of top, total root surface, and root surface at a depth of 4 to 8 inches (the depth indicated by field observations in the region served by Savenac Nursery as that at which it is most desirable to have the greatest concentration of root surface), the fertilized plots of western yellow pine received ratings ranging from 97 to 131.4. For Engelmann spruce no significant results were obtained in this experiment.

In order to determine the best source of the elements shown by the triangle experiment to give best results with western yellow pine, tests were made with 30 common fertilizers or mixtures of fertilizers. The four that gave the best results, with the quantities used per acre, are as follows: A commercial mixture of superphosphate, bone meal, tankage, and guano, 4,322 pounds; blood and bone, mixed in the ratio of 2 to 1, 2,722 pounds; ammonium sulphate, 621 pounds; and dried blood, 908 pounds.

The circular is well illustrated. The portion dealing with maintenance of nursery soil fertility presents particularly valuable figures indicating average root development.

The methods used in conducting the experiments and in evaluating the results are of great value and should be applicable to most forest nurseries. Most of the conclusions arrived at may be of value elsewhere; in applying these results to other nurseries, however, it must be kept constantly in mind that because of wide variation in conditions each nursery represents an individual problem. Costs of purchasing and

⁵ Experiments in the Use of Fertilizers in Growing Forest Planting Material at the Savenac Nursery. Copies may be obtained free of charge, as long as the supply lasts, from the Office of Information, U. S. Department of Agriculture, Washington, D. C.

applying fertilizers, also, were not considered in the Savenac experiments. It is entirely possible that the practical nurseryman, considering values obtained per dollar invested, may prefer some fertilizer other than those which were considered to give best results in these tests.

Influence of Felling Season on Quality of Wood

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(From *Forestry*, the Journal of the Society of Foresters of Great Britain, December, 1930)

For centuries it has been the general practice in Europe to fell timber when the sap is "down." The custom, like so many traditional operations of a similar kind, probably owes something both to experience and expediency; for, although there is a widespread prejudice among wood users in favor of winter-felled timber, there are several independent but potent considerations which combine to make it more convenient for the forester to carry out felling operations in the winter. Previous research has failed to discover any inherent difference between wood from trees felled at different seasons, but has shown that the quality may be materially affected by the conditions to which the timber is exposed after felling. Chief among these is the greater liability of spring and summer felled timber to be attacked by wood-destroying insects and fungi. This report⁶ deals with the first part of an investigation into the influence of the felling season on the technical properties of Norway spruce and silver fir. Between September, 1926, and August, 1927, selected trees in a 120-year-old stand of spruce, silver fir, and beech were felled at monthly intervals. In order to eliminate the variable effect of the sun, the timber was felled in the early morning and piled under cover. Mechanical tests were carried out on specimens in the green and air-dry conditions and various other physical properties were investigated.

To summarize the results. It was found that the time of felling exercised no substantial influence on the specific gravity, moisture content, shrinkage, resin content, or working qualities. Important differences were observed in the rate of drying; samples from trees felled between October and January dried extraordinarily slowly and evenly, taking six to eight months to reach the air-dry condition, while samples taken between May and July attained the same condition in one to two months. It is especially noteworthy that the slow drying rate of the winter-felled samples was maintained through the summer months, so that these samples were overtaken by others which were felled later in the same year. The results of the tests on mechanical strength

are not included in the report but will be published elsewhere.

In a series of carefully controlled experiments of this kind it is inevitable that the attempt to eliminate all factors but the one under examination results in the experimental conditions being widely different from those which prevail in actual practice. Taking it for granted that the preference for winter-felled timber rests on a real difference in quality, the fact that, under the conditions of the experiment, the felling season had no important effect on the technical properties serves to concentrate attention on the conditions under which extraction and conversion are usually conducted. It is then seen that the real influence of the seasons is through the effect of the weather, in controlling the drying of the timber and the activity of insects and fungi. Having regard to these conditions, it is concluded that the most suitable season for felling is autumn and early winter (from September to the end of November). The earlier in the autumn the timber is felled, the more likely it is to dry down gradually to a reasonably low moisture content and the less likely to be attacked in the spring by fungi and insects.

It is generally admitted that in the past forestry has been too much concerned with volume production and too little with the improvement of quality. In recent years signs have not been lacking of a change in attitude and it is also realized that wide economies can be effected by intensive utilization methods. A report such as this, which directs attention to the ways and means of minimizing the deterioration of timber after felling, comes at an opportune time.

The results of tests on the durability of samples under ordinary conditions and after artificial infection in the laboratory will form the subject of a second report to be published at a later date. Judging from an account of this work which was given to the Fifth International Botanical Congress at Cambridge, these results are likely to prove the most important of the whole investigation.

Recent Publications of the Forest Service

Technical Bulletin 223-T, Reproduction on Pulpwood Lands in the Northeast, by Marinus Westveld.

Miscellaneous Publication 106-M, Pine Tree Treasures, by Nina Owen.

Miscellaneous Publication 107-M, An Explanation of American Lumber Standards, by C. V. Sweet.

National Forest Administrative Maps: ½ inch, Trinity; ¼ inch, Nezperce, Manti.

National Forest Proclamation Diagram, Nezperce.



A complete list of the more formal publications of the United States Forest Service as of January 1, 1931, is available for distribution. Requests should be addressed to the Division of Silvics, United States Forest Service, Washington, D. C.

⁶ Knuchel, Herman: Untersuchungen über den Einfluss der Fällzeit auf die Eigenschaften des Fichten- und Tannenholzes. I. Der Einfluss der Fällzeit auf einige physikalische und gewerbliche Eigenschaften des Holzes. Beiheft zu den Zeitschriften des Schweizerischen Forstvereins. Buchdruckerei Böhler & Co. Bern, 1930.

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